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THE PRIMITIVE VEGETATION OF NEW ZEALAND.

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THE early colonists encountered for their farming operations a vegetation differing altogether from that to which they were accustomed in the temperate Northern Hemisphere. Meadows, in the ordinary acceptation of the term, were altogether wanting, their place being occupied by a close growth of tussock-grasses strawlike in hue, with stiff, long, persistent leaves, seemingly of little moment for pasturage. Further, where the tussock association was absent much of the land was covered with dense, more or less impenetrable evergreen forest, not in the least like that of temperate lands in general, but possessing a true tropical stamp. Such a tree covering obviously denoted an excessive number of rainy days, and clearly pointed out the futility of engaging in certain classes of husbandry. Then, there were extensive swamps, as also many

other plant formations, but most of the latter were of but little moment from the agricultural standpoint.

This primitive plant covering then was, plus the soil—this latter in part a result of the vegetation—the material which the farmer had either to destroy and replace or to utilize; it was in fact either his deadly enemy or his friend. The story of how the face of nature has been changed within a brief period into meadows, cornfields, gardens, and orchards is one of intense interest with a profound scientific bearing, but it does not concern this article, the object being to speak briefly of the pre-European plant covering and its history.

The Origin of the New Zealand Flora.

An examination of the species of which the flora is composed shows its remarkably diverse origin. It is by no means one homogeneous whole, but consists of several distinct elements. First comes that out of which a great part of the forests is constructed which is related to the flora of the Malay Archipelago, and so of tropical origin, a fact clearly demonstrated in the slight frost-toleration of many indigenous trees. Here come in not only many woody plants, but also the greater part of the ferns, some being identical with those of Malaya. Next there is a well-defined Australian element, but one generally much less conspicuous in the landscape than the Malayan,* consisting as it does largely of grasses, sedges, small-flowered ground-orchids, and other lowly herbs. Then there comes a very remarkable element indeed, possessed by New Zealand in common with the high mountain flora of eastern Australia and Tasmania, whose nearest relatives are found in Chile, Fuegia, Patagonia, and that ring of small subantarctic islands (Falklands, Kerguelen Land, Crozets, &c.), which extends right round the globe, the islands themselves far distant from each other. This latter element may be termed the Subantarctic. Again, there is a very large element made up of species, and even genera, found in no other part of the earth, which includes no less than 74 per cent. of the flowering-plants, ferns, and fern-allies, or, considering the dicotyledons alone, 85 per cent. This element, the endemic, is by no means of uniform composition, some of its members being closely related to species of one or other of the foreign elements, but there is a considerable percentage that one may conclude is purely of New Zealand origin. This latter, so far as the growth-forms of its members and their physiological capabilities are concerned, is much more closely related to the subantarctic than to

* If the New Zealand grass *Poa caespitosa* is identical with the Australian species it affords a striking exception to this statement.

the other elements, and both are especially conspicuous in the high mountain vegetation. Finally,* there is an element, truly indigenous, the presence of which is not as yet satisfactorily explained, whose members are either identical with species of the Northern Hemisphere or extremely closely related to such. Here, *inter alia*, come in certain ferns, grasses, and sedges.

The above brief statement of the affinities of the flora naturally leads up to the question of how a flora so varied managed to reach and occupy a group of islands surrounded by a vast stretch of ocean. To ask the question is easy enough, but a satisfactory reply is one of great difficulty, demanding data not available at present, and answered only by the employment of imagination and conjecture plus certain geological evidence and biological statistics, together with a consideration of means of transit of seeds, &c., across hundreds or it may be thousands of miles of landless ocean. Here, too, the opinion of one man is of much less moment than that of the many who have given consideration to this difficult subject. But unfortunately there is no uniformity of opinion, the authorities on plant and animal distribution being divided into two opposite schools, the one denying the possibility of long-distance transit and invoking great changes in the land and ocean areas, while the other believes in the comparative permanence of oceans and continents and in the likelihood of certain classes of animals and plants being conveyed by winds, birds, floating logs, and so on to almost any distance. This latter school generally neglects the question as to the possibility of establishment of an organism even if its seeds, &c., arrive intact after long travel, but it assumes that during enormously long periods there must be sufficient arrivals for successful colonization.

Taking the case of New Zealand, the consensus of opinion is that there has been once or twice land connection with Malaya, and I may add there may have been an early connection with Australia. It is over the South American or the Antarctic connection that the biological battle is waged, for the ocean-depths between New Zealand and Antarctica are in part very considerable,† so far as is known. However, the zoological evidence, thanks in part to the researches of Benham and Chilton in this country, is so strongly in favour of a former land bridge—evidence not based on a few isolated cases, but on whole groups of the lower animals—that I for one, though reluctantly, declare in favour of great land-exten-

* A subtropical or tropical cosmopolitan element may also be distinguished, but how far certain of its species are truly indigenous no one can say.

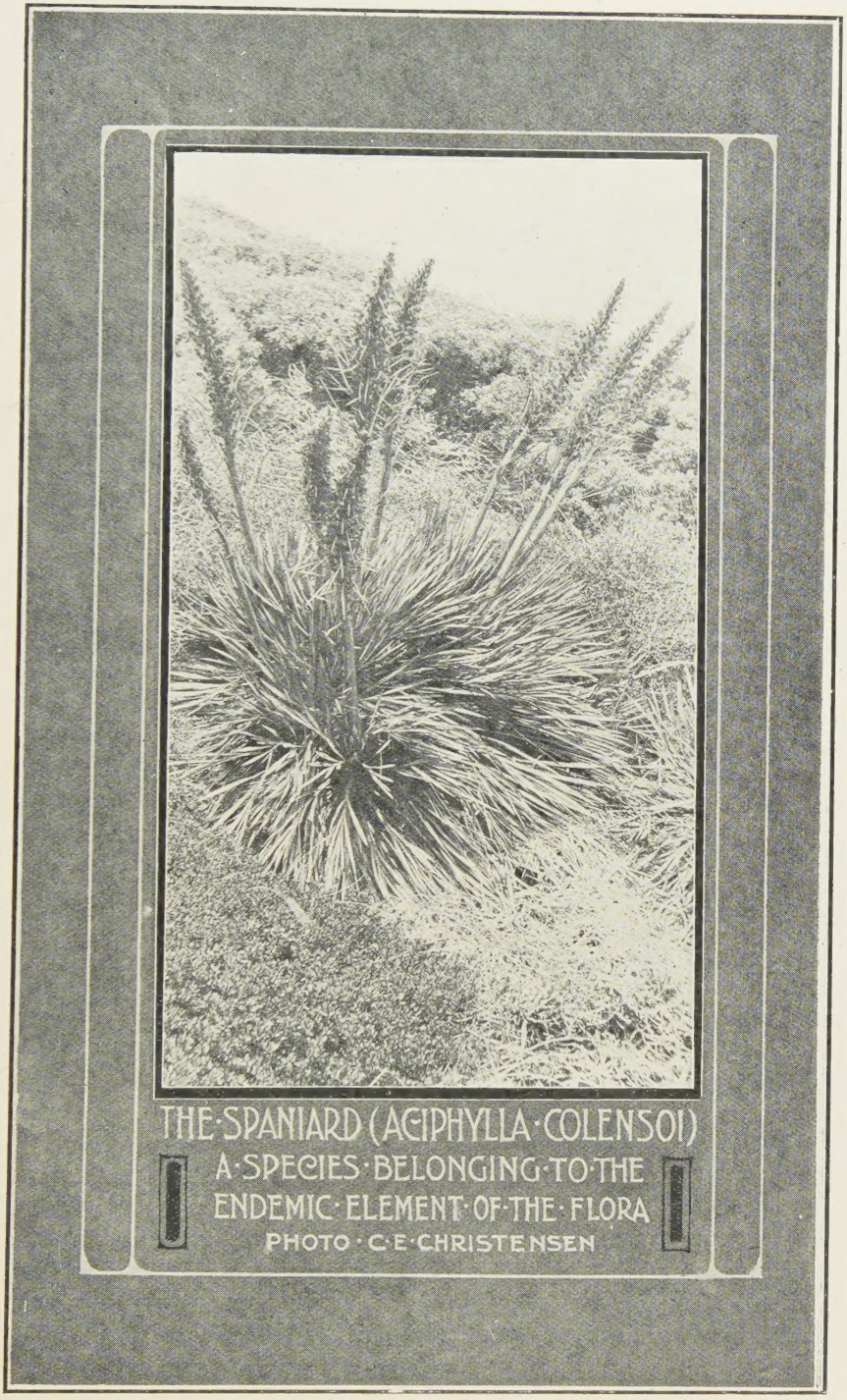
† From a little to the south of Campbell Island up to about the Antarctic Circle the depth is some 9 000 ft., but far too few soundings have been taken, and the depth may be less in many places.

sion. Moreover, speaking as a plant ecologist, the extreme difficulty of a species being able to establish itself, especially if a stable plant covering be already present, weighs with me strongly. In support of this view there is the remarkable fact, not yet sufficiently known to biogeographers, that in New Zealand, notwithstanding the host of introduced plants (more than 513 species), many of them the most aggressive weeds of the Old World, which in New Zealand thrive amazingly, none are established in any actually virgin plant association, aquatic and some rock associations excepted: *i.e.*, in those places where man, grazing-animals, and fire have not been, notwithstanding wind-transit and carriage by both indigenous and introduced birds, primitive New Zealand still exists.

The view, then, put forth here is that New Zealand possessed a primitive flora of her own, which probably formed part of that of a wide land area, perhaps united to Antarctica; that at an early date the ancestors of the present subantarctic element came in; that later there was an invasion of tropical Malayan species, and also perhaps of the Australian element, these happenings occurring during a great northern land-extension by way of New Caledonia and the New Hebrides. The reason for assigning an early date to the subantarctic colonization is that the southern beech (*Nothofagus*), a typical subantarctic genus, still maintains a few isolated outposts in the north of the North Island, while elsewhere it is, generally speaking, absent in the lowland belt, or, if present, confined to stations unsuitable for tropical rain forest. According to this view, a "struggle" between the subantarctic and tropical elements is postulated, through which many species of the former were driven into the mountains or the more inhospitable lowland stations. Further, that when, in mid-Tertiary times, New Zealand, through depression of the land-surface, became reduced to a few small islands, the climate at the same time being much warmer than now, many subantarctic species went to the wall, the few survivors, except *Fuchsia* and some others, being confined to the summits of the hills, faces of rock, and such other stations as offered tolerable conditions. After the Pleistocene glacial period, however, the bare ground abandoned by the retreating glaciers offered facilities for the development of new forms of plants, and the polymorphism of no few genera is due to the fact that most of their species are of recent origin, species-making still going on.

The Plant Formations.

Owing to the diversity of habitats which a region so mountainous as New Zealand offered, as well as to the gradual change in climate from the almost tropical Kermadecs to the subantarctic Macquarie



THE SPANIARD (ACIPHYLLA COLENSOI)
A SPECIES BELONGING TO THE
ENDEMIC ELEMENT OF THE FLORA
PHOTO · C. E. CHRISTENSEN

Island with its mild winter and sunless summer of low temperature, the plant covering consists of many classes of formations and associations. Those of such wide extent as to specially concern agriculture are—the rain forest, the southern-beech forest, the tussock steppe, the heath, the swamp, and the subalpine herb-field. Of minor importance are salt meadow, sand-dune, and high mountain fell-field.

The rain forest (see frontispiece) occupied virtually all the lowland and montane North Island, except where soil or climate were antagonistic. In the South Island similar forest, but less rich in species, covered considerable areas, especially in the west and south. On the east and north the distribution was disconnected. Stewart Island, even yet, is heavily forested.

This rain forest has usually one or other of the pines (taxads) dominant, of which the rimu (*Dacrydium cupressinum*) is the commonest. Where the ground was swampy the kahikatea (*Podocarpus dacrydioides*) would be virtually the sole tall tree, the straight, even trunks standing up in their thousands, like the masts of ships, and the head of foliage small, out of all proportion to the size of the tree. In many parts to the north of latitude 38° associations of kauri (*Agathis australis*) dominated the rain forest, or even formed pure stands of many acres at a time, their columnar trunks 4 ft. to 5 ft. or much more in diameter, and unbranched for perhaps 80 ft. The bulk of such kauri forest would be controlled by the taraire (*Beilschmiedia tarairi*) in the north, and by the tawa (*B. tawa*) and the tawhero (*Weinmannia sylvicola*) further to the south. On the volcanic plateau, with its soil of pumice, in many places the totara (*Podocarpus totara, P. Hallii*) was the leading tall tree. In western Nelson and the neighbourhood of the Otago fiords both taxad and southern beech occur together, but the general facies is that of rain forest. On Banks Peninsula *P. totara, P. Hallii*, and the matai (*P. spicatus*) were the important tall trees. In Westland *D. cupressinum* dominates, and *Quintinia acutifolia* and *Ascarina lucida*, small trees, are characteristic. In Southland and Stewart Island the rimu dominates in places, and the kamahi (*Weinmannia racemosa*) is extremely abundant.

New Zealand rain forest possesses the following special features: The trees are evergreen; woody climbing-plants are abundant; there are many epiphytes, some, as the species of *Astelia*, being extremely massive; ferns, including tall tree-ferns, are everywhere; filmy ferns, mosses, and liverworts abound; buttresses occur at the bases of many trees; the undergrowth is extremely dense and made up of many species; the vegetation is in several distinct tiers.

TUSSOCK-STEPPE ON MALVEN HILLS
CANTERBURY
WITH THE RED TUSSOCK
(DANTHONIA RAOULII)
IN THE FOREGROUND
PHOTO L. COCKAYNE

Thanks to the abundant humus-content of the soil, the ground is eminently suitable for agriculture; indeed, although the conditions for forest and grass land are supposed to be the very opposite, New Zealand forest is potential meadow. But, really, the environments under which these two formations maintain themselves are not identical. True, the climate is the same for both, so far as rainfall is concerned, but it is quite different with regard to certain other factors, each formation providing its own special conditions. Thus, to mention certain factors, the forest-shade, the absence of wind, the humidity of the air beneath the trees, the humus-content, and to some extent the water-content of the soil depend very largely upon the trees themselves, while, were the meadow not constantly grazed, its ultimate form would be very different.

The southern-beech forest (see frontispiece) is of much less economic importance than rain forest, since it occupies poorer soil. The dominant species are the black-beech (*Nothofagus Solanderi*), at the lower altitudes; the red-beech (*N. fusca*), from sea-level to the subalpine belt; the silver-beech (*N. Menziesii*), as for *N. fusca*, but ascends higher; and the mountain-beech (*N. cliffortioides*), the tree *par excellence* of subalpine forest.

Generally, southern-beech forest is rather poor in species, and though many of the rain-forest characteristics are still present they occur in a much lesser degree, while in some associations they are virtually absent.

Tussock steppe (see p. 407) is of the two classes "tall" and "low," the former usually subalpine; but in Southland, broad areas in the lowlands are dominated by the red tussock (*Danthonia Raoulii*), a mark of wet, sour soil. Low-tussock steppe is a characteristic formation for the drier parts of the South Island, where comparatively low rainfall and violent winds are antagonistic to forest. The dominant tussocks are the silver-tussock (*Poa caespitosa*) and the hard tussock (*Festuca novae-zealandiae*), the latter tolerating the drier situations. Where the tussocks do not touch, or growing through them, are other indigenous grasses and herbs. Drought-enduring shrubs, especially the spinous wild-Irishman (*Discaria toumatou*) and species of New Zealand broom (*Carmichaelia*), leafless, rigid shrubs with green, flat, or terete branches. The genus would be confined to New Zealand were it not for a species on Lord Howe Island. In the lowlands some cabbage-trees (*Cordyline australis*) will probably be dotted about.

Wide areas at the present time are occupied by thickets of manuka (*Leptospermum scoparium*), which form a dense growth much taller than the heaths of Europe, but yet may be classified as heath. There is also abundance of fern heath composed of bracken (*Pteridium esculentum*). Doubtless these two formations,

occurred more or less commonly in virgin New Zealand, but though at the present time they bear all the appearance of being primitive and contain definite combinations of species and but few introduced plants, he would be bold indeed who would pronounce such heaths truly primeval, so greatly have they been modified by repeated burning. The heath associations are extremely difficult to profitably turn into agricultural lands, both manuka and bracken reappearing again and again after burning. The most important heath associations occur on the Auckland gum lands, these originally kauri forest, and the volcanic plateau.

Primitive swamp consisted largely of almost pure raupo (species of *Typha* related closely to the European *T. angustifolia*) and, where water did not lie all the year round, of New Zealand flax (*Phormium tenax*). Swamp, too, is the home of the niggerhead (*Carex secta*), which builds up for itself a trunk out of its dead parts. Extremely extensive swamps originally occupied much of the Waikato plain.

The dunes of New Zealand contain no less than 300,000 acres. The indigenous sand-binders are the silvery sand-grass (*Spinifex hirsutus*, also Australian) and the endemic pingao (*Scirpus frondosus*). There are certain special sand-shrubs—*e.g.*, *Pimelea arenaria* and *Coprosma acerosa*. Sand plains and hollows, the only parts suitable for farming, are frequently occupied by manuka heath. Other coastal formations are—mangrove (*Avicennia officinalis*) swamp (this only in the north); salt swamp with *Leptocarpus simplex* and a rush, *Juncus maritimus* var. *australiensis*; salt meadow formed of various turf-making herbs; coastal rock where the pigs-face (*Mesembryanthemum australe*) is characteristic; coastal forest, made up of certain special species of trees and others from rain forest; and coastal scrub, especially well developed in Stewart Island and the Otago fiords, where the fine puheritaiko or mutton-bird scrub (*Senecio rotundifolius*) is characteristic.

But little can be said here about the high-mountain vegetation with its total of 945 species, 506 of which never descend below 2,000 ft. altitude. Above the forest-line there is frequently a dense scrub of stiff or wiry branched shrubs growing so closely that one can hardly force a way through the mass. Very conspicuous are the shrubby *Compositae* and *Epacridaceae*, the species of *Veronica*, the celery-pine (*Phyllocladus alpinus*), the mountain-totara (*Podocarpus nivalis*), and two species of *Dacrydium*. In harmony with the rainfall, so is there in a dry climate an open association of fell-field and, where wet, a closed association of herb-field. Fell-field contains many of the most bizarre of New Zealand plants, all especially capable of resisting extreme drought. Amongst these are the spaniard (*Aciphylla Colensoi* [see p. 405]), the coral-broom

(*Corallospartium crassicaule*), and the tussock-like *Celmisia Lyallii*, its leaves with the microscopic structure of a steppe-grass.

Herb-field, since it occurs on the wettest mountains, which below are densely forest-clad, has hardly been exploited by the farmer, though it contains many plants suitable for pasturage. Here are acres at a time of the great white buttercup with its huge peltate leaves, *Ranunculus Lyallii*, and several equally beautiful species of the subantarctic genus *Ourisia*. Above all there is a wealth of mountain-daisies (species of *Celmisia*), the most characteristic genus of the high mountains.

The different plant formations, which together make up the whole plant covering of New Zealand, are not immutable entities. On the contrary, all are in a constant state of change. Each has its special life-history, which is bound up with geological and climatic change, and with more rapid alteration brought about by the plants themselves. Heat, light, wind, moisture, soil, and other factors all influence both plant form and distribution; but so long as a habitat remains stable, so long may it be expected to support a definite combination of species — *i.e.*, a plant association. A study of the vegetation as it now is teaches a good deal as to how it has arisen, but the matter is too lengthy and abstruse for discussion here. Suffice it to say that studies such as this deal with the fundamental questions on which agriculture is based. Certain New Zealand associations, for instance, show a definite rotation of crops. Others demonstrate how according to the conditions a certain species may become dominant or go to the wall, as the case may be.

Before concluding, a few statistics concerning the flora must be given. The families number 103, of which the following are the largest: *Compositae* or daisy family, 259 species; ferns, 144; figwort family, 137; grass family, 127; sedge family, 124. The number of the genera is 381. Those with most species are—*Veronica*, 101; *Carex* and *Celmisia*, 55; *Ranunculus*, 46; *Coprosma* and *Olearia*, 43; *Epilobium*, 40; and *Senecio*, 34. My estimate of the species of flowering-plants, ferns, and fern-allies is 1,771,* of which 162 are ferns, &c., 397 monocotyledons, and 1,212 dicotyledons. The average number of species to each family is 17·2, and to each genus 4·6. The above figures are by no means final; "new" species in no small number are being described yearly, so that it may be expected that at the very least 100 "good" species remain to be added in due course to the catalogue.

* Apart from the species certain to be discovered, numbers of aggregate species will be split up by workers in the future. From the farming standpoint an aggregate species is meaningless.

FARM CROPS IN NEW ZEALAND.

F. W. Hilgendorf, D.Sc.

Rotation of Crops.

In a country of the great range of latitude (34° to 47° S.) that occurs in New Zealand many varied methods of agriculture are to be found. In the north maize is the most common cereal crop, and in the south it is practically too cold for wheat. Further, by far the largest part of the country is in permanent grass and never comes under the plough. In these circumstances it is impossible to say what is the usual rotation of crops, but where the plough is used one of the commonest rotations is to break land out of lea that has been down about four years and sow turnips or rape. These are followed by wheat, then oats and grass-seeds sown at the same time, and the resultant pasture allowed to lie for about four years again. Many variations are introduced—for instance, the land on being broken out of grass is sown in wheat, then oats, then rape and grass-seeds mixed, and so back to the three to five years in pasture. Often, of course, a crop of mangels or potatoes takes the place of rape or turnips, and in some localities a crop of peas may come before the wheat; but the general rule is to have the land broken up for three or four years and occupied with root crops or cereals, and then down in grasses and clovers for four or five years.

The treatment of the crops used in these rotations will now be discussed under the following heads:—

(A.) Grass.

(B.) Forage crops to supplement grass—

(1.) In summer—Rape, kale, silver-beet, maize.

(2.) In winter—Turnips, oats, barley, wheat, hay, lucerne, mangels.

(C.) Cereals, &c.—Wheat, oats, barley, maize, peas.

(D.) Potatoes.

(A.) Grass.

Of the 40,000,000 acres of occupied land in New Zealand, 30,000,000 acres, or 75 per cent., are under grass. Over 60 per cent. of this is natural grass, and of the remainder a very large proportion has been surface-sown on bush burns, and is not likely

to come under the plough for a score of years, if ever. This leaves a comparatively small area—about 5,000,000 acres—of grass that can be considered as a farm crop. As stated above, the grass is generally sown with another crop—usually with oats in the autumn or spring, or with rape in the early summer. With oats is perhaps the favourite method, but in districts where grass is often eaten out by grass-grub (the larvæ of a New Zealand beetle closely allied to the European cockchafer) it is common to sow down with rape, as the sheep are then on the land when the beetle is laying its eggs. A comparatively small acreage is sown with grass without a cover-crop, and sometimes this is done with Italian rye wanted for winter or early spring feed. The grass-mixture sown is almost invariably a mixture of Italian and perennial ryes, cocksfoot, and red and white clover. Perhaps an average mixture would be 5 lb. Italian rye, 12 lb. perennial rye, 3 lb. cocksfoot, 2 lb. red clover; 1 lb. white clover—total, 23 lb. Crested dogstail, fescues, and timothy are used in very much smaller proportions; and, of course, for special areas other grasses are employed.

The grasses are for the purposes of feeding sheep and lambs, and to a less degree cattle. At two periods of the year—namely, during the height of summer and during winter—the grass is liable to failure, and for this reason there are sown great breadths of supplementary fodder crops. These account for about half of the ploughing done in the country, as the following figures will show: 1913—Grain and pulse for threshing only, 580,000 acres; rape and turnips, 714,000 acres. To the grain and pulse for threshing there must, however, be added oats grown for ripening and cutting into chaff for horses, and also oats and barley for green feed for sheep. In 1910–11 the cereals and pulse for threshing were 692,100 acres, and the cereals not for threshing 322,000 acres. Of this amount two-thirds were probably for chaff; and thus on an average we get the following acreage of crops grown: Cereals and pulse for threshing, 600,000 acres; cereals for chaffing, 200,000 acres—total cereals, 800,000 acres. Rape and turnips, 700,000 acres; cereals for green feed, 100,000 acres—total sheep-feed, 800,000 acres. Potatoes, 25,000 acres; mangels, 10,000 acres.

(B.) Forage Crops.

(1.) *Summer Crops.*

Rape.—About 250,000 acres are sown annually in all parts of the country from north to south. Land is ploughed either out of grass or the stubble of a preceding cereal crop, and is got ready

for seed in October or November—that is, early summer. On the better-farmed land one would expect the ground to receive the following working: Plough out of grass in winter 3 in. or 4 in. deep; harrow in spring; plough again in late spring 6 in. deep; cultivate with spring-tooth cultivator, then harrow. The seed is sown with a drill of colonial design. It has thirteen or fifteen coulters 7 in. apart, and the seed and manure are sown by force-feed from two separate boxes at the same time, and drop down the same tube into the ground. The rape is sown in 7 in. rows, about 2½ lb. to the acre, and with it is sown the manure at the rate of 1 cwt. to 1½ cwt. per acre. The manure is either guano (from the South Sea islands), superphosphate (from Japan) with about 40 per cent. tricalcium phosphate rendered water-soluble, or a local freezing company's manure. These local fertilizers are a by-product of the lamb-freezing industry. They are made from the digested and dried blood and intestines of the sheep, the bones of the feet and heads, with added superphosphate of foreign origin, and frequently some potash salts. A typical analysis of such a manure is — Insoluble nitrogen, 2 per cent.; tricalcic phosphate (rendered water-soluble), 7·64 per cent.; tricalcic phosphate (insoluble), 19·64 per cent.; potassic oxide, 1 per cent. Some tricalcic phosphate is mined locally and converted into superphosphate, while a small proportion is further treated with lime to make basic phosphate—a manure that, together with imported basic slag, has now some slight vogue for rape or turnips. (Basic slag is, of course, very largely used for top-dressing pastures.)

In December or January (*i.e.*, midsummer) the rape is fed off by ewes and lambs or by newly weaned lambs, which are then sold fat to the freezing-works. The rape is generally fed a second time by late lambs, although its quality is then poorer. On the lightest lands the rape may be left over winter and give a bite again in spring, but the land is usually winter-ploughed for wheat. Rape is in dry districts and seasons often completely destroyed by aphis.

Kale.—Thousand-headed kale is used to some extent to replace rape, but it is found to be very much less palatable, so that lambs do not fatten well on it. It, however, holds a great quantity of stock, and is hardly at all susceptible to attacks of aphis. It is sown 3 lb. to the acre in October, with 1 cwt. to 2 cwt. of the previously mentioned manures, in rows 28 in. apart, and is intercultivated once or twice during its growth. It is nearly always fed off two or three times in summer and autumn, and not infrequently left till the succeeding spring. The stalks are considered a nuisance when cultivating for the succeeding crop.

Silver-beet.—A small area of this plant has been sown, but it is hardly beyond its experimental stage. It was taken up by the Department of Agriculture in response to a demand by sheep-fatteners for a forage plant that could be fed off and that would not suffer as rape does from the attacks of aphis. It is sown in October (late spring) at the rate of 4 lb. per acre, in 28 in. rows, and demands frequent intercultivation with horse-hoes. It is fed once or twice in the autumn and several times in the succeeding spring, giving, under very careful management, great quantities of feed. Its fattening-qualities are still in dispute, and as for palatability, it is decided that sheep do not like it at first, but afterwards eat it with fair zest. It is by some recommended for cows as a fodder that gives plentiful feed and does not taint the milk.

Maize.—This is grown to a considerable extent in the dairying districts of the North Island to serve as feed for cattle. It is cut green and carted out to the cows when feed fails during the drier summer months.

The foregoing crops are intended to supplement the summer grass so as to fatten stock. The following are to supplement the winter grass so as to hold stock:—

(2.) *Winter Forage Crops.*

Turnips.—About 500,000 acres of turnips and swedes are sown annually. Whether turnips or swedes are grown depends on the attacks of aphis and diamond-back moth, and these in turn depend upon the rainfall. In general, where the rainfall is below 30 in. soft white turnips are grown, Imperial Green Globe being the favourite variety. They are sown in December (*i.e.*, midsummer) at the rate of about 12 oz. to the acre, in rows 14 in. apart on the flat, and nearly always with 1 cwt. of superphosphate. They receive no further treatment till about June (midwinter), when they are fed off by ewes or young sheep, the paddock being divided up into "breaks"—areas sufficient to hold the sheep feeding on them for about a fortnight. The grubber then raises the previously buried parts of the turnips, and the sheep after eating these up are removed to a fresh "break." The turnips are usually finished in August, and the land may be ploughed for rape or possibly for spring oats.

In the wetter and especially the colder districts Aberdeen turnips are more largely grown, and treated just as white turnips are. Where the rainfall is at or above 50 in. swedes are used. These are frequently sown in raised drills 28 in. apart, and thinned and

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A Mangel Crop on the Farm of

JAMES JOHNS, NORTH CANTERBURY.

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intercultivated so that very large crops result. The average yield of turnips and swedes is estimated at 16 tons.

Oats for Green Feed.—A considerable though lessening area of oats is put in in the autumn to provide green feed for sheep in winter and early spring. These oats are usually put in on skim-ploughed wheat stubble at about 2 bushels per acre, without manure, and may be allowed to run to a crop, or, if the feeding has been severe and late, will be ploughed in in the spring and the land sown with rape.

Barley and Tares.—This mixture—or it may be oats and tares—is being increasingly used for winter feed. About three-quarters of a bushel of barley and three-quarters of a bushel of tares are sown in the usual 7 in. rows, and usually with 1 cwt. superphosphate or other phosphatic manure. After feeding-off in spring the crop is usually ploughed in, or may be allowed to run till the oats are nearly ripe, when the mixture will be cut for hay.

Wheat for Green Feed.—In the wheat-growing area (chiefly Canterbury) the autumn-sown wheat is almost invariably fed off in early spring by ewes with lambs at foot, and a large bulk of feed is then incidentally obtained.

Hay.—Whenever there is a great flush of grass in December so that the stock cannot keep it down, each farmer usually shuts up one or two paddocks and cuts them for hay. This hay-cutting usually takes place, however, only about one year in three or four. A few farmers are now growing special crops—notably oats and tares, or oats and peas—to provide hay; and in addition to these must be mentioned lucerne hay, now of growing importance.

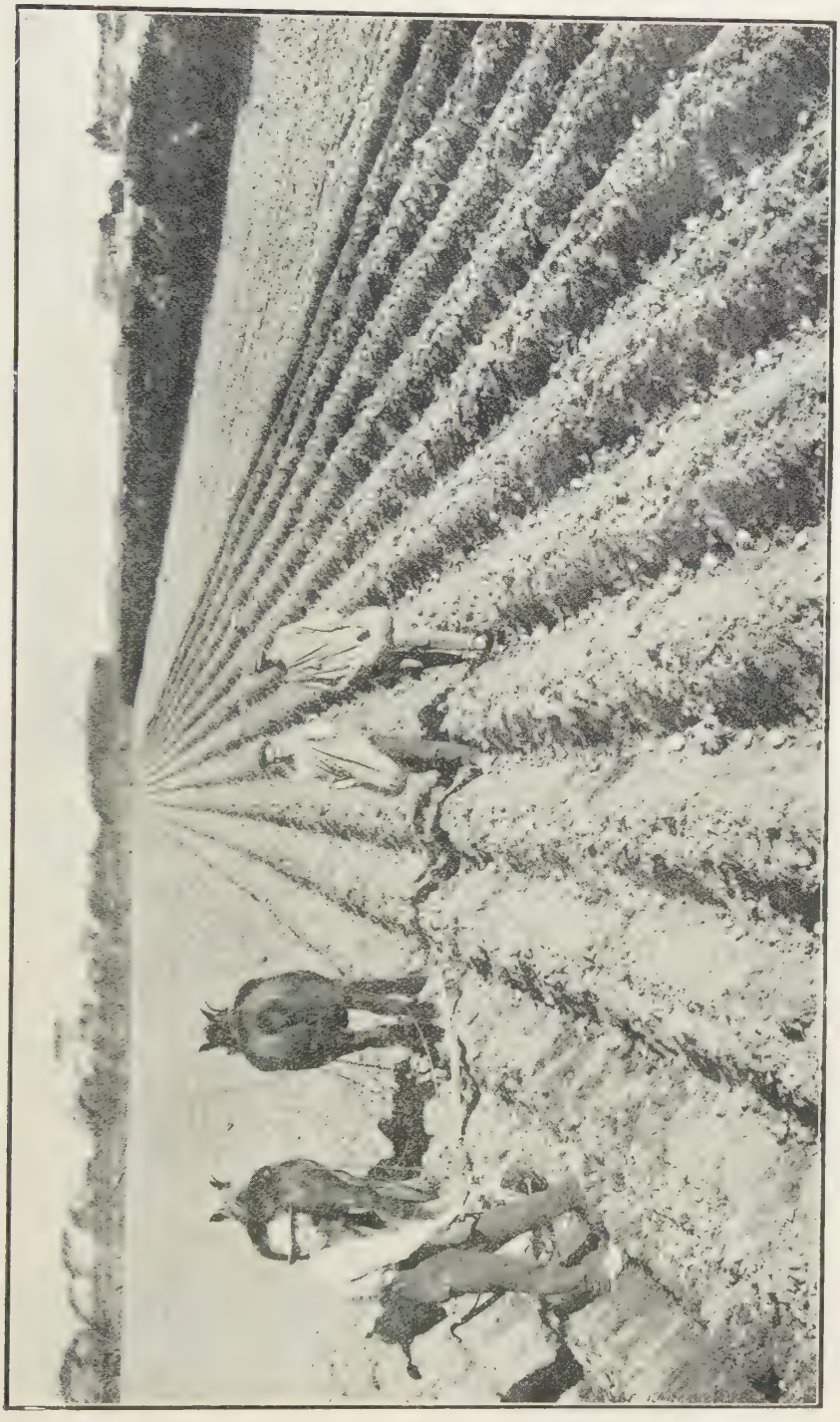
Lucerne.—In Marlborough lucerne occupies a really important place in ordinary agriculture, but elsewhere one can find only small patches of a few acres on occasional farms. The Department of Agriculture has done much to spread the use of this valuable plant by supplying free seed, lime, and inoculated soil to farmers in all districts, the farmer undertaking to put in the seed under certain agricultural conditions. The land is well cleaned by fallowing or by ploughing in a smothering-crop, worked down and manured with lime (if possible) and phosphates, and then finished with a Cambridge roller. The seed (12 lb. to 15 lb. per acre) is surface-sown and covered with brush harrows. The crop is cut once or twice the first season, and thereafter four or five or more times each year. The lucerne is either carted out green to cattle, or more frequently made into hay for winter feed for cattle or sheep. It is not usually grazed.

Mangels.—Ten thousand acres of mangels were grown last year, and were estimated to produce 31 tons per acre. They are sown in October, 4 lb. per acre, with 3 cwt. to 4 cwt. of local manures, including potash. They are sown on the ridge in wetter districts and on the flat in the drier ones; thinned and horse-hoed. They are pulled and stacked into heaps in early winter, and then carted out into the grass-paddocks to cattle, or less frequently to sheep, during the winter months.

(C.) Cereals.

The cereals occupy a somewhat less important place than do the forage crops in the general agriculture of the Dominion. They take up, however, practically as much land, but this is chiefly concentrated in Canterbury and Otago. They are not as universally distributed as are rape and turnips. There were last year 166,000 acres ploughed for wheat for threshing only, 361,000 acres for oats for threshing only, 32,000 acres for barley for threshing only; and these figures are all about 10 per cent. below the average.

Wheat.—As stated above, there were sown last year 166,000 acres of wheat, producing 5¼ million bushels, at an average yield of 33·3 bushels per acre. The average acreage is 230,000, and the average yield 30 bushels, thus giving an annual yield of about 7,000,000 bushels—not much more than sufficient for local requirements. There is little export trade, the freight absorbing a large proportion (about 25 per cent.) of the value of the wheat. The most common varieties are Red Chaff or Hunters (not the English Hunters), Tuscan (of two varieties), and Pearl or Velvet. None of these are definitely connected with any of the European wheats, from which they were originally derived. Resistance to wind is, next to yield, the most important quality in a New Zealand wheat. Wheat is sown usually in autumn or winter at the rate of 1 to 1½ bushels per acre, usually without manure or with 1 cwt. of superphosphate. It is fed off in the spring, cut in February, and stacked in the field for a few weeks, or, as is frequently done, is threshed direct from the stook by contractors' travelling threshing plants and teams of men. The threshed grain is bagged and carted to the granary, or more frequently stacked on a bed of straw in the field till time serves to cart it to the railway-station for transport to the miller. There is little profit in growing wheat. The price is kept down by the drawbacks to exportation and the cheap production in Australia, from whence flour is imported in times of shortage, paying a duty of £1 per ton. The straw when threshed is stacked in the field to sustain the cattle in some following winter when the paddock has been laid down in grass.



Planting Potatoes, Willowbridge, South Canterbury.

Oats.—Oats are sown in autumn or spring at the rate of 2 bushels per acre, invariably without manure. They are threshed from the stook, or are stacked in the field where they grow, until wanted for chaff, when the sheaves are chaffed by travelling contractors' plants. The 361,000 acres threshed last year produced 14,800,000 bushels—an average of 41 bushels per acre. The oat straw is stacked from off the elevators of the threshing plant, and as the three or four years' lea usually succeeds the oats, the straw is eaten by sheep or cattle grazing on the young grass in the succeeding winter. In the North Island, with its warm climate and copious rainfall, oats suffer much from rust, but the Department has recently isolated Green's Ruakura oat, which is to a considerable extent rust-resistant.

Barley.—About 35,000 acres are sown in barley for threshing, and the average yield is about 38 bushels per acre. Most of this area is in Marlborough and Canterbury.

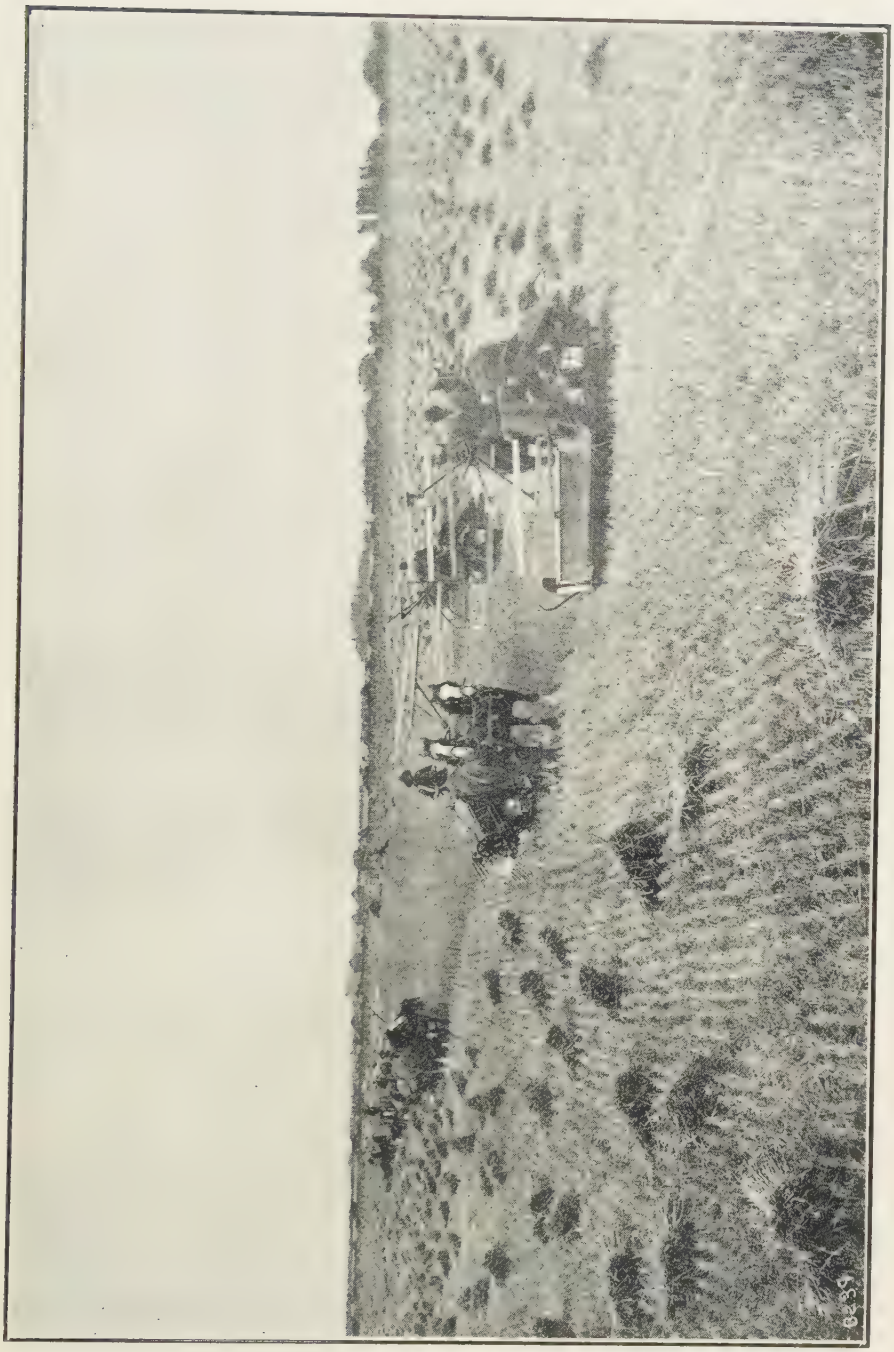
Maize.—About 5,000 acres are sown in maize, chiefly in the Auckland Province. The yield is about 46 bushels per acre. A large quantity of maize is grown in the North Island to be fed green to cattle during summer.

Peas and Beans.—About 20,000 acres of peas are grown, yielding on the average about 30 bushels per acre. They are sown chiefly between or before cereal crops as a preparation of the land, and also often because the weather has made it impracticable to get wheat in until too late. About 5,000 acres of peas are sown in Marlborough and about 6,000 acres in Canterbury for seed purposes. The commonest variety is Partridge, but for seed many other sorts are grown. The peas are either threshed from the swathe or stacked in the field until it is convenient to thresh them.

Beans account for nearly 2,000 acres, and yield about 40 bushels per acre.

(D.) Potatoes.

Nearly every farm grows a certain small acreage of potatoes, and the total area planted varies from 25,000 to 40,000 acres. A few men make a specialty of this crop. The average yield is now about 6 tons, a reduction from the 8-ton average of ten years ago, due largely to the incursion of potato-blight occurring at about that time. Spraying and planting and digging by machine are adopted by only the larger growers, the majority being contented to risk the blight, to plant in the plough furrow, and to dig by hand. The favourite variety is Up-to-Date, and the product is almost entirely consumed in New Zealand.



A Canterbury Wheat-harvesting Scene.

Visitors from Britain who have read the foregoing account will find numerous differences between British and colonial farm crops and their management. Most of these differences are accounted for by our milder climate. In the North Island the grass is hardly checked in winter, and even in the southernmost parts of the Dominion cattle can pass the winter out-of-doors. There being no necessity to house cattle explains several things — such as the absence of purchases of artificial foods, the casual character of the hay crop, the leaving of all threshed straw in the field, and finally the absence of the use of farmyard manure. One may say that the farmhouse vegetable-garden absorbs all the stable manure produced. One other difference between New Zealand and English practice is explained by climate—namely, that here we use very little nitrogenous manure; and this is applied in the form of dried blood to rape, mangels, &c. The warm dry summers assist nitrification in the soil to a very great extent, and as a general rule the use of nitrates, &c., with cereals has not hitherto paid. The rarity of the use of lime has, however, no climatic explanation. Many, perhaps most, of the soils are deficient in lime. Lime in any state for agricultural purposes is carried free on the railways for 100 miles, yet as a rule little lime is used, except in a few districts, such as Southland, where its very conclusive advantages have led to liming having been overdone on certain farms.

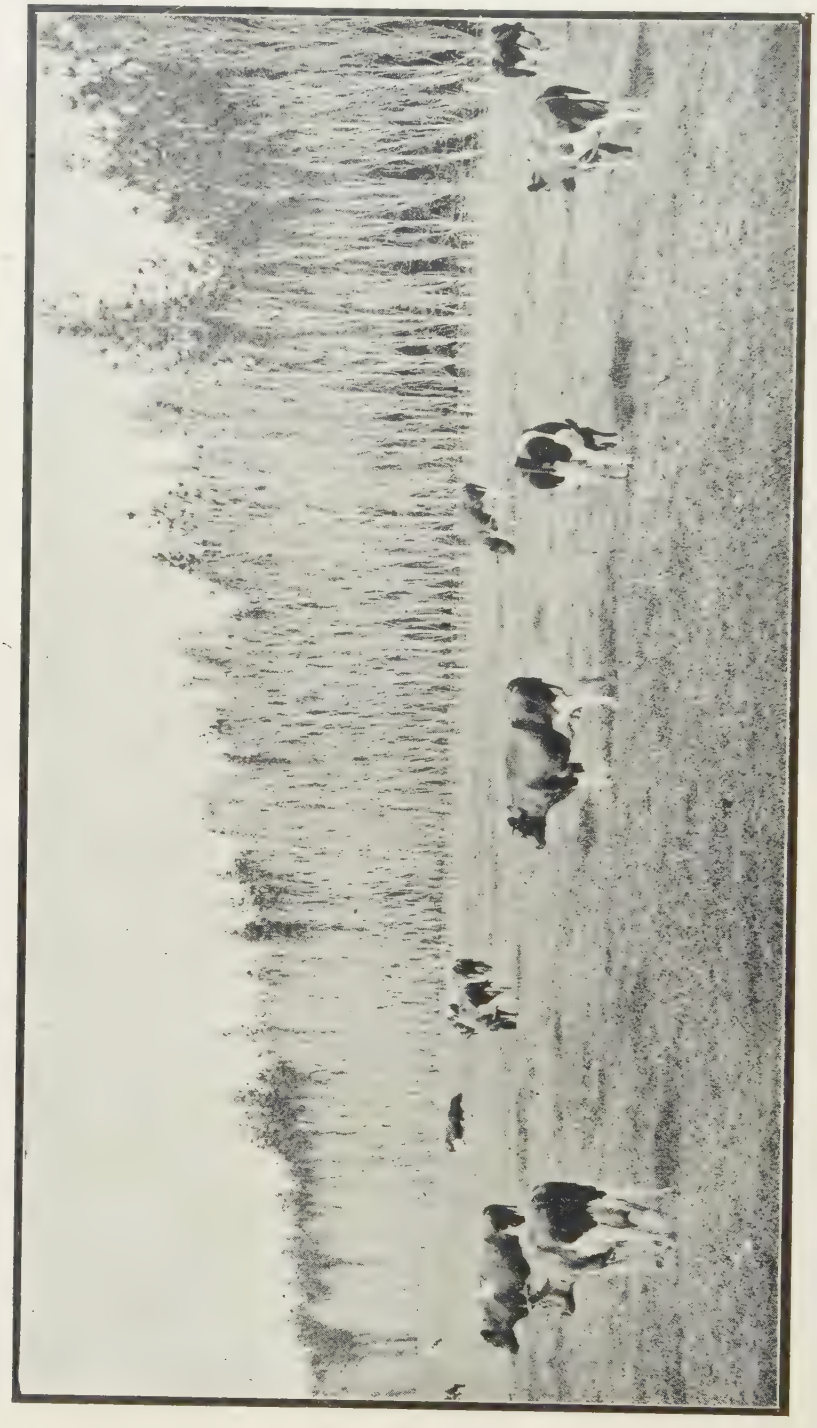
The difficulty of securing labour, and its high cost when procured, act in the same direction as the mild winters in checking any tendency to hand-feed stock in winter, though there is little doubt that in many districts the stock would profit thereby. It is the labour problem that keeps down the acreage of mangels, and that will militate against lucerne—both of which crops require carting off before feeding—as well as against silver-beet, which requires much cultivation during its period of growth. The favourite crops are those that lend themselves to extensive farming.

DEMONSTRATION WORK.

A COUNTRY WITH MANY PROBLEMS TO SOLVE.

J. Duncan.

New Zealand is a country so distinct in character, so dissimilar to any other part of the habitable globe, and contains within itself such great variations of soil and climatic conditions, that the farmer, even he who has wide knowledge of agricultural practice in other lands, finds himself continually confronted with difficulties arising out of the new conditions and the special environment. The need of assistance by way of experimentation, but more particularly demonstration of the methods found best suited to local conditions, has therefore been necessary in the work of profitable utilization of the land. The need of this assistance was not realized in the early settlement of the country, as the principal agricultural activity was concentrated in the South Island, where the natural covering of indigenous herbage in the extensive tracts of open country did not present many difficulties to the farmers of Britain who settled it. The climate, too, was very similar to that of the Mother-country, this necessitating the growing of winter stock food as a necessary phase of farming operations. The pioneers of the South were largely comprised of farmers well trained in the best methods of British farm husbandry, and a good class of farming was rapidly developed. It was when the development of the North Island, largely forest-clad country, began in earnest—when the exportation of perishable produce was made possible by the refrigeration process — that the need for experimental farms became evident. This section of the Dominion was absolutely dissimilar to the South, being of a more recent geographical construction, to a large extent volcanic in its nature, and therefore presenting to the settler a mass of contradictory circumstances, the varying soils requiring special treatment and the local environment often demanding original procedure. These problems were in some cases rendered more complex by a warmer climate, characterized by occasional spells of dry weather. The necessity of testing manurial treatment, systems of cultivation, crops to be employed, and the best varieties of the suitable plants for the environment and objective was especially necessary in a country where many



Members of the Holstein Herd of the Weraroa Experimental Farm.

men on the land were working with limited capital, which, combined with high-priced land and the difficulty of securing competent workmen, made it a costly matter for the individual farmer to conduct the desired experiments himself. Further, when the experimental farms were initiated it was generally with the idea of solving some local problem or demonstrating the need of special procedure necessary to secure the most successful utilization of the land.

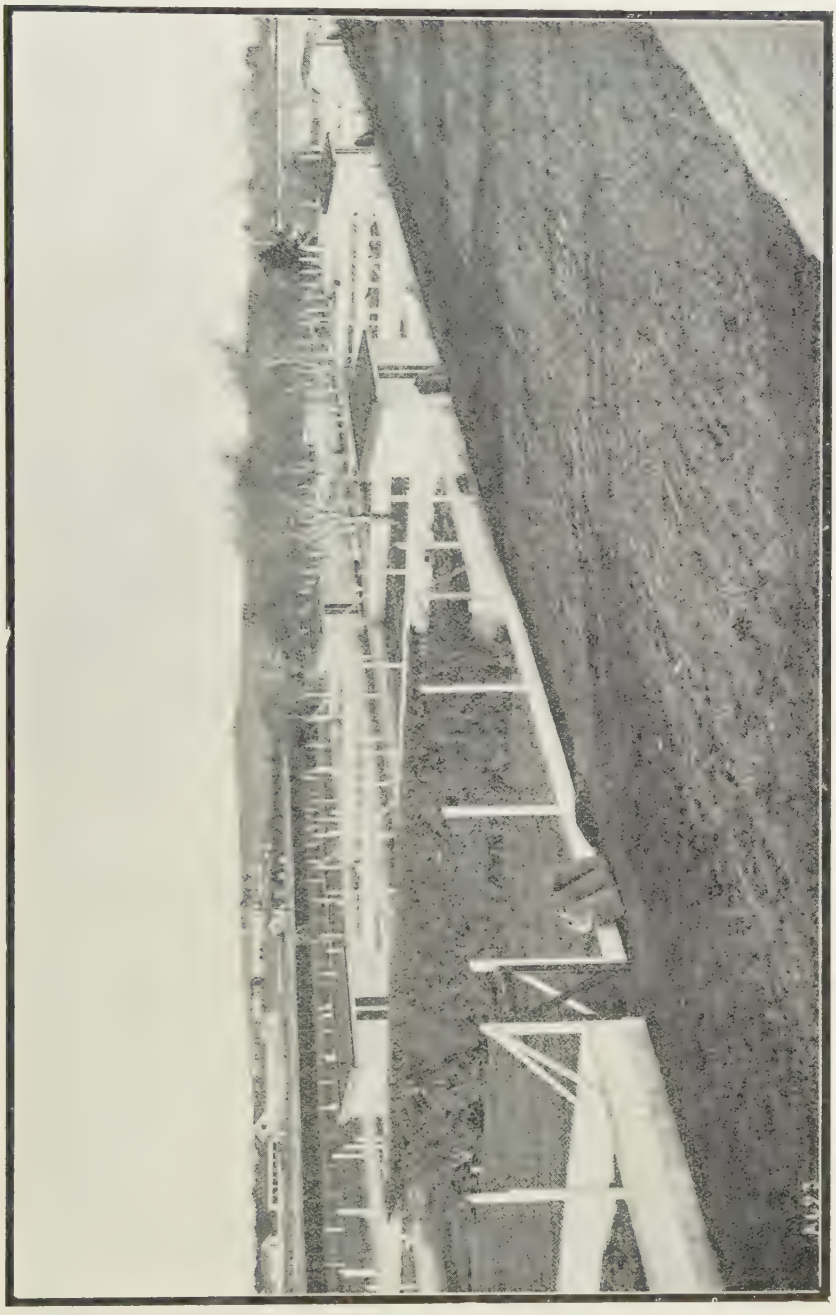
Experimental and Demonstration Farms.

The Weraroa Farm has been hewn out of a typical rain forest, the soil being largely of a rich swampy character, demanding good drainage, a comparatively small area being of a lighter and shingly nature. On this property the production of supplementary crops to pasture for feeding in dry summer spells and in the colder winter months has been the main object. Good work has also been done in the breeding of heavy-milking cattle—Holsteins and milking Shorthorns—according to the pedigree of performance, the Weraroa sale by auction of the annual draught of milk-record bull calves having initiated in this part of the world this system of stock-disposal. A flock of Romney sheep is also depastured on the property.

Moumahaki, near the southerly end of the Province of Taranaki is situated on a coastal forest plateau, the soil covering being of a light nature characteristic of the more inferior portions of that rich grazing district. Here the value of green-manuring as the best means at the command of the North Island farmer for adding humus to the soil is demonstrated, while at a more recent period the farm has carried out a comprehensive demonstration in the value of lucerne as a soiling and grazing crop as well as a medium of creating soil-fertility. As at Ruakura, a special officer is engaged at plant-breeding work, and in addition to many tests in progress an Ayrshire herd is being developed on milk-record principles, while a Border-Leicester sheep flock is maintained.

Very definite indeed was the objective in establishing the Ruakura Farm. This property is situated at the end of an arm of the great Piako Swamp, and was a characteristic swamp (the vegetable covering being quite destroyed by fire in much of it), with manuka-heath downs rising in the centre. This most unpromising site was selected to demonstrate the possibilities of drainage and thorough cultivation in bringing poor swamp soils into a productive state, while the heath downs afforded a good opportunity of demonstrating the possibilities in top-dressing, and this in a district where this means of pasture-renovation was then practically

Ruakura Farm of Instruction in the Making.



Ruakura Farm of Instruction at the Present Time

unknown. The results achieved at Ruakura have fully justified the original policy. Areas which were once regarded as worthless and in some cases incapable of conversion into profitable land are now fertile fields carrying luxuriant crops. The condition of the whole property is a splendid demonstration to the farmers of the district of the potentialities of even the most unpromising of their soils. The farm is now being largely devoted to the testing of crops, fruit, bees, poultry, &c., while Jersey and Shorthorn herds are being developed from a milking viewpoint, and Southdown and English Leicester sheep are bred.

Waerenga is still another instance of a Government experimental farm solving the problem of how to deal with refractory land—a gum-land heath. This country at the time it was taken up by the State was regarded as practically worthless for agricultural purposes, being commonly described as a poor pipeclay soil devoid of humus. Here was the first demonstration of the possibilities of one of the poorest of New Zealand soils for the production of fruit. The black-wattle was found to luxuriate in the environment and rapidly provided the needed shelter. Grapes are grown in the open to perfection, and good marketable wines are being made on the property. Other fruits, such as peaches, pears, and apples, also grow well. By judicious cultivation, aided by a medium manurial dressing, it has been shown that even cereals may be grown on the uninviting medium, and the humus being gradually added with the continued use of the land is improving the fertility of the soil.

At Tauranga, in the Bay of Plenty, and at Arataki, in Hawke's Bay, special fruit-testing stations are serving a good purpose in introducing the most approved methods of fruit-culture in districts which are specially suited for that particular industry.

It is gratifying to know that the farms are appreciated, as proved by the large numbers who visit them at all seasons of the year in search of information.

State Farms as Training Centres.

In the world of agriculture to-day there is an increasing appreciation of the importance to agriculture of the expert husbandman. Experience is demonstrating that, while a study of the problems of the particular environment is necessary to the individual farmer, the first essential to successful production is a sound grounding in agricultural practice. The need of the day, it may be said, is the man trained in the best agricultural methods—the expert farmer who knows how to manage his soil to the best advantage, who is

THE LECTURE AND SITTING ROOM IN THE "LEARNERS'" QUARTERS, RUAKURA FARM OF INSTRUCTION

skilful in the use of agricultural implements, has due regard for care in the handling of live-stock, with a liberality in the feeding of it —and is thus able to obtain the highest possible returns from his land without exhausting its fertility. The successful farmer must be an expert in the practice of his industry rather than a student in the theory of it. The latter is desirable, but it is of secondary importance to the former. A sound training in the scientific principles of agriculture, or rather in the principles of one or more of the several sciences to which agriculture is tribute, are essential in the training of the teacher, the State expert, and the scientific investigator; but the farmer must first of all be a sound worker in the practice of his business. His success mainly depends upon the extent of his capacity in conducting the detail work of the farm. A man may be possessed of the best scientific know-

Soft-cheese Making at the Weraroa Experimental Farm.

ledge on agriculture, but if he be weak in his practice he will probably not be as successful as the man devoid of theory, and even may be illiterate, but thoroughly well trained in the practice of farming.

It was recognition of the importance of the practical training in agricultural methods for farmers' sons, combined with some tuition in the first principles of plant and animal life and the production and management of these, that led to the decision to combine the functions of a practical farm school with that of an experimental station. At Weraroa, Moumahaki, and Ruakura cadets or farm learners are now being accommodated. These youths take part in the ordinary work of the farm under competent overseers and

experts, their duties being so arranged that they have periodic training in every branch of the operations. Lectures and demonstrations are given by qualified authorities, so that the "learners" may obtain some knowledge of the underlying principles of the work in which they are engaged. The system is working well, and is decidedly popular; indeed, it is impossible to accept all who desire to take this advantage of a practical training in agriculture.

Co-operative Experiments.

The New Zealand farmer, more perhaps than he of any other country, requires to study his soil and his environment if he is to obtain the best returns from his labours. When in conjunction with this fact it is considered that the greatest benefit from an investigation will generally only be secured when the men concerned take an active interest in it, the value of co-operative field experiments will be at once realised. The co-operative field experiment is not only the best means by which a farmer may secure with rapidity a fairly accurate knowledge of the requirements of his land, but is necessary if he is to know if the result obtained on an experimental farm is applicable to his particular locality. This method of rural advancement was initiated by the Department in the year 1908, and since that time no less than eight thousand farmers have, under the supervision of officers of the Department, conducted tests on their own farms. The principle under which the tests are carried out is that the Department provides the seed and manure, the farmer finding the labour and taking the resultant produce. In some cases district high schools which have agricultural classes take part in this campaign, and in more than one instance the school authorities have arranged field-days on which large numbers of farmers have visited the test plots to study the results.

A Ruakura Scene.

BRITISH, AMERICAN, AND NEW ZEALAND AGRICULTURE: A COMPARISON.

Primrose McConnell.

Some one has said that "comparisons are odious," and they undoubtedly are to the community which has no desire to be in the forefront of civilization; but to that which desires to lead, a comparison may serve the double purpose of showing its true position and acting as a spur to legitimate ambition. In making comparisons there is often a tendency to forget that all countries have their particular conditions, necessitating different methods in dealing with their various agricultural problems—or, in other words, we are too ready to judge others from our own particular standpoint.

In Britain the history of agriculture dates back to the invasion of the Romans about two thousand years ago. The agricultural history of America (dating from its infancy) is about five hundred years old, while that of New Zealand may be put down at some fifty or sixty years. At first sight this may seem greatly to the disadvantage of the last-named country, but as a matter of fact it is not so. In all countries which can boast of an ancient history true agricultural progress is often hindered by the too close clinging to ancient traditions and customs. They are also often trammelled by the possession of more or less ancient implements and out-of-date methods. There is a natural suspicion of new things, and the too deliberate weighing of the advantages or disadvantages of a change.

New Zealand, on the other hand, is commencing her agricultural history at a time when agricultural science is making rapid strides forward; also, she may profit by the successes and mistakes of older countries, and is in a position to adopt the newest methods and implements without being burdened by the old; but she should not forget that much will be expected under such conditions.

In America—I refer more particularly to the United States—there seems to be a plethora of inventive genius, and a readiness to adopt new "notions," and yet it is only of late years that American farming could be described as other than the worst of

any of the highly civilized countries. Of late years, however, agricultural teaching in Britain and America has progressed rapidly. In the United States there are now one hundred schools of agriculture and about sixty experiment stations, and in some States the teaching of agriculture has been made compulsory in the public schools.

New Zealand is also on the alert, and in proportion to her population she is making fair progress towards the desired end, and in coming to a conclusion as to the best system of agricultural education she will again benefit by the experiences of older countries. At present New Zealand owns six experiment stations and one agricultural college, to which may be added the very extensive experimental work carried on by the Department of Agriculture in co-operation with the farmers of both Islands. Much may also be expected from the newly formed Board of Agriculture. In both the elementary and high schools of New Zealand agricultural teaching is rapidly developing, and there is every sign that there will be much greater development in the near future. In the writer's opinion the agricultural teaching given at such schools should be mainly practical, and of sufficient interest to give the pupil a bias towards rural life. The great difficulty to be encountered is to find teachers with any practical experience.

A comparison of the individual farmer of the three countries under discussion is a delicate and somewhat difficult task, but the American and the New Zealand farmer have much in common. In both countries the average farmer has gone on to the land with little capital and comparatively little experience, and in many instances he has attained success mainly through the system of land-tenure obtaining, which enables the man on the land to become the owner of the land he cultivates. The average American and New Zealand farmer is a hard worker, and the younger generation of both countries is commencing to take an active interest in modern methods. As showing the rapidly increasing demand for information on all agricultural subjects coming from the New Zealand farmer, I might state that during the past year, roughly speaking, several thousand farmers have applied for advice, verbally or by letter, at the Ruakura Farm of Instruction.

Taking general farming ability into consideration, the best of the British farmers undoubtedly stand head and shoulders above all others, and in live-stock breeding in particular they are the experts of experts. The true British farmer is the product of many generations of practical experience and keen observation. He discovered scientific farming unawares, as it were, and for many years has

been adopting scientific methods which no findings of present-day science will ever alter. There is much that is pleasant in his life, and farming runs in the blood. Unlike the average American or New Zealand farmer, the average British farmer of the best class knows little of hard physical labour. As a rule he employs a foreman or manager who is competent to oversee the whole of the agricultural work, keeps a good hack or two and has an occasional spin with the hounds, employs a staff of house servants, and altogether lives the life of the country squire, although only a tenant farmer. If he runs a dairy herd he generally hands the responsibility and worry over to a family who, in return for a share in the profits, provide the whole labour required to work the dairy. That in many instances he is conservative in his methods must be granted, but in this direction also a rapid change is coming about. It must not be accepted, however, that all British farmers live a life of ease—many work very hard indeed. It is the general opinion that the British farmer works with out-of-date implements, and in some districts such is the case; but on the average farm of the best class the most up-to-date machinery may be seen. As a matter of fact, implements are now being introduced to New Zealand which were in use in many parts of North Britain twenty to thirty years ago. It should be remembered that an implement which suits the conditions of one country may be entirely unsuited to another.

When the three climates come to be compared, New Zealand has an enormous advantage over the other two countries. The New-Zealander knows nothing of the laborious winter work that must be faced in Britain and in many parts of America, or of the expenditure incurred in connection therewith. Housing of farm stock, with the attendant expense of providing elaborate buildings, is almost unknown, particularly so in the North Island. The staple food of all live-stock in New Zealand, summer and winter, is grass, and practically all supplementary feed is grown on the farm. Under such natural conditions all stock thrive and fatten much better than they do under the necessarily artificial and costly conditions obtaining in Britain and many parts of America during winter. In many instances farm horses do not even feed under cover, and stabling overnight, particularly in the North Island, is almost unknown. In winter-time each horse is protected by a waterproof canvas rug. The staple food is chaffed oat-sheaves, plus a run on the pasture. Under this simple and inexpensive system horses keep in excellent health, as is proved by the fact that at Ruakura for the past three years, although there are forty horses of all ages, there has not been a single case of illness.

For the New Zealand dairyman winter is his holiday; for the American and British dairyman winter is a time of unceasing drudgery and expenditure. Many herds of cows in New Zealand are wintered outside, and receive absolutely no food except pasture grass. Bullocks are turned into a swede-paddock, and with the aid of no other food are turned off fat in a few weeks. Cattle wintered under such conditions in Britain and America would die. Practically no artificial stock-food is used in New Zealand, while in Britain the yearly outlay in purchased stock-food is often double the amount of the yearly rental. It is well to admit, however, that the time has arrived when a small outlay in supplementary stock-food (which should be grown on the farm) will amply repay the New-Zealander who is aiming at intensive farming.

Even in the matter of pig-breeding climatic conditions favour the New-Zealander, and if gone about in the right manner no branch of New Zealand farming will return a more handsome profit. In Britain and America the housing of pigs in winter is imperative, while in New Zealand they will live and thrive almost shelterless. Green forage may be provided all the year round. During the past winter at this station a number of pigs have been kept in excellent condition on chaffed lucerne hay, and artichokes, which they rooted out themselves, having no shelter whatever. Others have been wintered on mangels and hay with equal success. In Britain and America the wintering of pigs under such conditions is impossible. In fact, the New Zealand farmer has not yet realized what enormous possibilities there are in pig-farming; but the pigs must be of the right sort. In America pig breeding and fattening is an extremely profitable industry, the principal food—maize—being grown on the farm at a comparatively small cost. Lucerne, whether as pasture, hay, or meal, also plays an important part in pig-raising, and little or no food is purchased. It is quite certain that if pig-breeding can be so successfully carried out in a country which has a severe winter to contend against, success in New Zealand should be still more pronounced, aided as we are by the best of climatic conditions.

Intensive farming as it is understood by the American and British farmer is quite a different thing to intensive farming in New Zealand. Intensive farming in Britain and America means the cultivation of a comparatively few acres on the market-garden principle, the revenue being drawn from the direct sale of crops grown on the farm. This requires a maximum of labour in proportion to the area cultivated. In New Zealand the farmer's main revenue is obtained through the breeding and sale of live-stock and their products, and intensive farming means to him

intensive stock-farming, which under New Zealand conditions can be carried on successfully, and maximum results gained at a minimum cost of labour and food, although wages are more than double those obtaining in Britain.

It is true that the British farmer knows nothing of land speculation and borrowed money as we know it in New Zealand and as they know it in America, and that land-values seem to be high in comparison to those obtaining in America and Britain; but, taking all circumstances into consideration, the writer is of opinion that the average land in New Zealand is still cheaper than in the other two countries under mention, and that some of the systems of land-tenure obtaining in New Zealand enable the man of comparatively small capital to work his way upwards with the prospect of a competency, and of land and roof-tree which he may call his own. In Britain at least this is next to impossible. The Home farmer, who is a tenant only, requires a working capital of £10 per acre, with no hope of ever becoming the owner. In New Zealand many farmers have commenced with a capital of less than £1 per acre, and have ended in being the owners of many acres of well-stocked land.

The "homestead" system of the United States of America enabled thousands of farmers to settle on the land under easy conditions, and it is estimated that the American Government has disposed of nearly 100,000,000 acres of land. In the early days much of that land was farmed under a system of soil-robbery until, under the inducement of higher earnings in industrial centres, many forsook their land entirely. Although the conditions during the past few years have changed for the better, only a short time ago hundreds of farms in the United States were derelict and soliciting purchasers or tenants. In New Zealand the demand for land far exceeds the supply, and derelict farms are, as far as I am aware, non-existent.

Contrary to general opinion, less than two-thirds of the whole farming population of the United States are owners of the land which they cultivate, and 22 per cent. of the men who tenant the land are share tenants only—than which, in the writer's opinion, there is no less desirable form of land-tenure.

The landlord system in Great Britain may be economically wrong, but to represent the average landlord as a kind of modern Shylock, as is often done by the critic who is ignorant of facts, is ridiculous in the extreme. The writer is the son of a tenant farmer, and has had twenty years' experience of the landlord system; and although he has known a number of instances where

oppression of the worst kind was carried out by the landlord, and more by the agent unknown to the landlord, yet on the best estates the tenant farmer lives under the happiest conditions, and, if he be a reasonably good farmer, his tenure is as secure as if the land were his own. It has to be remembered that the upkeep of a large estate which is equipped on the most modern lines is very great indeed, so great that the yearly rent-roll does little more than wipe out the annual cost of upkeep. Many instances are on record in which the landlord has spent more than double the yearly rental on estate improvements for several years in succession without demanding any increase of rent. Compensation for improvements carried out by the tenant is now provided by law, which to some extent makes the tenancy more secure.

On the other hand, no one who has given this matter any thought can doubt that the prosperity of a country is on a secure basis when the farm holdings are comparatively small, the occupier being also the owner. Such a system is not only good economically speaking, but also breeds the truest patriotism and a thrift that is in every way desirable. In Britain many obstacles have to be removed from the small-holdings system before it can become a pronounced success, obstacles of which we in New Zealand know nothing. It has to be admitted that if small farms could be offered in Britain at a reasonable rent, plus fixity of tenure, the demand for such farms would be unlimited. Only $3\frac{1}{2}$ per cent. of the applicants for small holdings are in a position to purchase the land, but the other $96\frac{1}{2}$ per cent. might make successful farmers under an assisted-tenancy system. In justice, however, it should be pointed out that many American tenants—even share tenants—succeed in becoming owners of the land which they have previously tenanted, although in many instances they have gone on to the land with little or no capital.

What inducement, then, has New Zealand to offer that cannot be offered by the other two countries under mention? It may be all explained in the one word "climate." Critics from the Northern Hemisphere who do not take this one word into consideration, and who know of the high rate of wages we pay, laugh at the very idea of intensive farming in New Zealand. But in no country in the world are there such prospects for intensive stock-farming, and in no country will the work be carried on under such enjoyable conditions.

There are many inducements to offer the farm hand that other countries cannot offer, and for the thrifty man the future is assured. If he be an emigrant from Britain his social position is improved

from the instant he touches New Zealand soil. He feels that there is no social bar between him and his employer, and this feeling gives him a hope for the future which he never experienced before. The British farmer, although generally kind to his employees in his way, looks upon them as being infinitely beneath him socially.

In New Zealand the breeds of live-stock are similar to those in favour in Britain, and many of our pedigree-stock breeders are meeting with pronounced success in the show-ring, even in competition with some of the noted breeders of Britain, and here again our climate enables us to undertake even the breeding of pedigree stock at a fraction of the cost necessary in Britain or America.

Comparing the crops grown in the three countries respectively, New Zealand's list is a comparatively simple one, and although she can grow wheat, maize, oats, barley, and rye to perfection, and can show yields which no other country can surpass, her export trade in these products is a negligible quantity, and she is not likely to do more than keep pace with the increase of population. Grass and forage crops are her mainstay, and lucerne is, without a doubt, destined to play a prominent part in connection with her live-stock industry, as it is now doing in many parts of America. In New Zealand the energies of the agriculturist should be centred on the profitable production of mutton, wool, beef, butter, cheese, and their various by-products. Prospects for the New Zealand fruit industry are also becoming brighter.

America, possessing as it does a climate ranging from the tropical to the arctic, has a corresponding range of products, and hence presents a choice of farming systems which no other country can offer, and her extensive industries enable her to provide a ready market for almost everything a farmer can produce. For the expert market-gardener, or "truck" farmer, no country offers greater inducements, as the demands for his produce are almost unlimited.

The staple products of the British farm are similar to those of New Zealand—namely, beef, mutton, wool, and all dairy-products, also wheat, oats, barley, and potatoes. A very lucrative export trade in pedigree stock also exists. The British climate, however, makes it very difficult to produce many of the valuable forage crops grown in New Zealand, and while the pastures of the latter are available all the year round, those of Britain are of comparatively little value during six months of the year, and at the best the average British pasture has to be supplemented by the purchase of costly artificial foodstuffs. In the North Island,

at least, two crops in the year may be grown on all well-cultivated soil. It may be said that New Zealand must suffer through the lack of farmyard manure, but when necessary to do so it is infinitely cheaper to resort to green-manuring, and catch-crops for this purpose may be grown without interfering with the main crop of the season. Further, it is quite possible, on the best pastures of New Zealand, to carry six sheep to the acre all the year round. As a matter of fact, some pasture on the Ruakura Farm, originally poor land, has carried during the past year eleven sheep per acre, and they had absolutely no other food supplied; not only so, but several lots were turned off during the year prime fat. The writer is of opinion that in no other country in the world is such a result possible. Valuable stud ewes live during the whole winter on grass alone, and the only difficulty is to keep them from becoming too fat.

The inducements which New Zealand offers to the farmer are many and real, and in no other country can a pleasanter home be made.

In the year 1840 the first pioneer settlers reached New Zealand from Great Britain. To-day the population is estimated to be 1,097,278. From the 41,000,000 acres of land being utilized rural members of the community exported last year £22,775,877 worth of farm-products. The total area of the country, counting mountain and lake, is 65,440,815 acres, and of the area in occupation 24,000,000 acres are still in native grasses or in their original state. At an outside estimate the exports from this unimproved land will not exceed in value £4,000,000, so that in reality New Zealand last year exported £18,755,877 from an area of 17,000,000 acres of land, which represents an average of just over £1 2s. an acre as a surplus production.

SHEEP-BREEDING IN NEW ZEALAND.

James G. Wilson.*

"Not one man in a thousand has accuracy of eye and judgment sufficient to become an eminent breeder. If, gifted with these qualities, he studies the subject for years and devotes his lifetime to it with indomitable perseverance he will succeed, and may make great improvements. If he wants any of these qualities he will assuredly fail. Few would readily believe in the natural capacity and years of practice required to become a skilful pigeon-breeder."—Darwin.

The history of sheep-breeding in New Zealand has never been written, and, unfortunately, the material available for the would-be historian is meagre and disjointed, for many of the pioneer breeders have gone, leaving no record of the part they played in founding this greatest of our industries, while those who are still in the world have yet to tell of their share in its establishment. This we do know: the first sheep brought to New Zealand arrived in the early "forties," by brigs, from New South Wales; indeed, for some years there was quite a trade between Sydney and New Zealand in both sheep and cattle. Sheep had been imported into New South Wales in the latter part of the previous century and had increased with wonderful rapidity, although little endeavour had been made to raise the standard of the stock being bred. They were, of course, Merinos, a breed that is apparently capable of standing cold and heat alike. Not only was the Merino found to be suitable to both the soil and climate of Australia, but the hardiness of the breed and the age to which the sheep lived enabled the squatter to stock up new country and yet have a considerable surplus to send to New Zealand. Gold had not then been discovered in Australia, therefore there was practically no outlet for the surplus stock, except for new country. The opening-up of a market in New Zealand was consequently most opportune for Australian breeders. Sheep were by this time cheap in Australia, but apparently about £2 a head landed in New Zealand.

Sir Frederick Weld, whose life has just been published, speaks of taking sheep to the Wairarapa about the year 1844. The first record we have of sheep reaching the South Island was when Messrs. Clifford and Weld took sheep into Marlborough in 1847 in order to stock up Flaxbourne, which they had just leased from the redoubtable Te Rauparaha. These sheep formed the basis of the 24,000,000 sheep which represent the present flocks of the

* President of the Board of Agriculture.

Dominion. The open Canterbury Plains, and, indeed, the whole of the tussock country which is characteristic of the eastern districts of the South Island, as well as the Hawke's Bay Province and the Wairarapa Valley in the North Island, and the easterly districts of the north, was the first country stocked. All that was required by the pioneer sheep-farmer was a shepherd and some dogs, for the native grasses provided nutritious pasture, and the sheep thrived on it. There were no dingoes as in Australia, and thus the settlers had little difficulty in keeping their flocks apart until they could erect fences. The early days of sheep-farming in Australia were very different. There the native dogs and hostile blacks necessitated the yarding of the sheep at night.

The Canterbury Merino.

I have never seen it satisfactorily explained why the Merino was chosen as the breed for Australia. The first sheep imported were obtained from Bengal, but these were of a nondescript character. About the same time a Royal flock of Merinos was established at Windsor under the supervision of Sir Joseph Banks, the botanist who accompanied Captain Cook. This had been secured from Spain by George the Third, and was the Negretti strain.

In 1797 some Merino sheep were purchased at the Cape, which had been imported there from the Royal flock at Windsor by a Mr. Gordon, and on the death of that gentleman they were sold by his wife to two traders who took them to Sydney. There some of them were purchased by Captain Macarthur, and they had a most marked effect upon the flocks which were then in existence in the colony. Captain Macarthur visited England in 1804, when he purchased six more Merinos from the Royal flock, and secured a

grant of 5,000 acres, which he called Camden Park. There the flock was kept intact for fifty years without any fresh blood. Some portion of this flock is still kept in Victoria, more from sentiment than from anything else. In my early experience in Victoria, about 1871, I saw these sheep. They were much smaller than the Merino, and had very black tips to the lock, which the owners were breeding out. As a contrast to them, I also saw the great sheep "Sir Thomas," bred by Mr. Gibson, of Tasmania. He was in a cage when he was offered in Melbourne, and the cage was carefully padlocked, so that he could not be handled. Messrs.

A Corri dale Ram

Cuming bought him for over 700 guineas (a price unprecedented), and the sale caused great excitement. He did much to improve the breed of Merinos in Victoria.

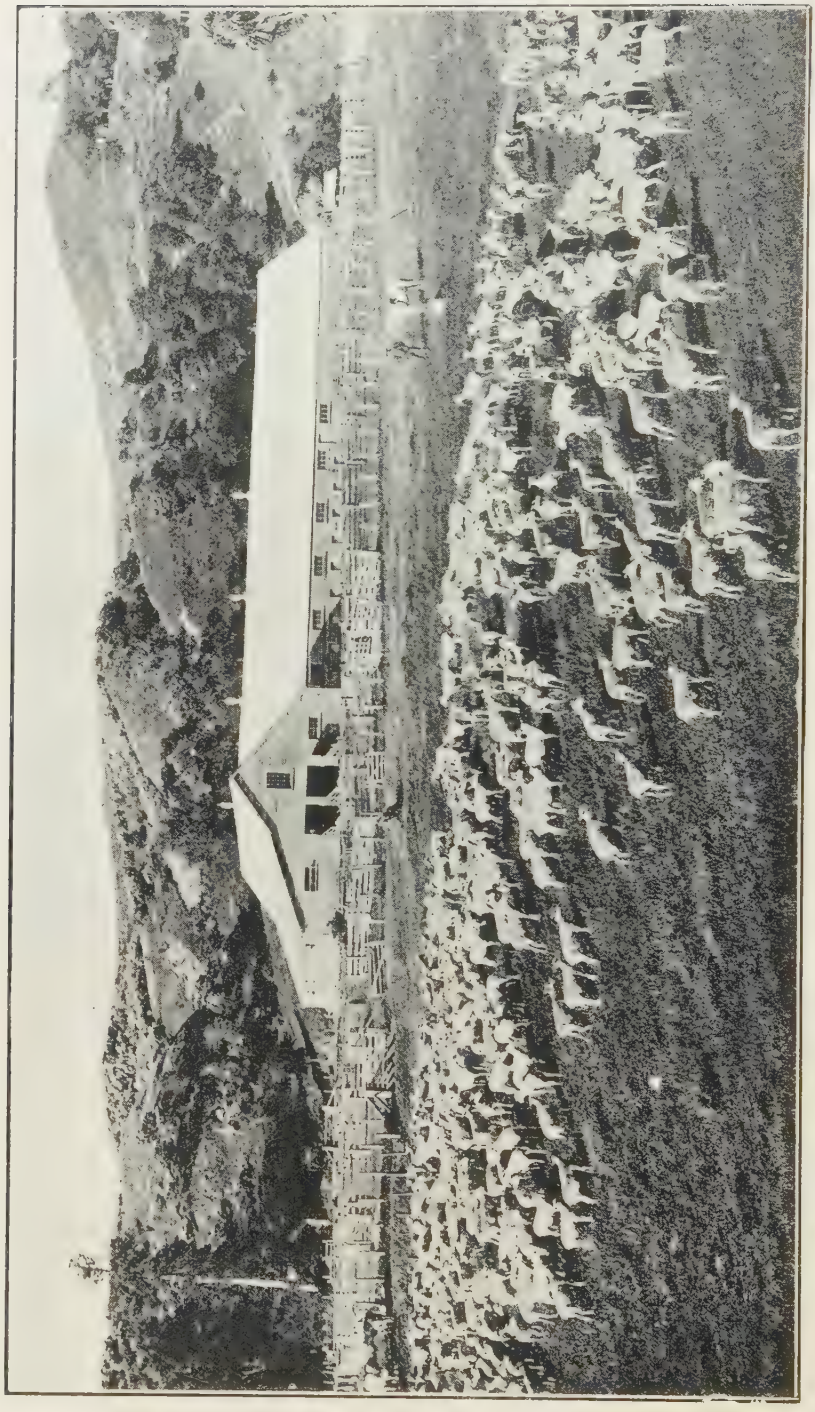
The Rev. S. Marsden, the centenary of whose first visit to New Zealand in 1814 is shortly to be celebrated, also obtained a few of these Cape Merinos, and later he received a present of some sheep from the Royal stud at Windsor. He then became one of the pioneers in sheep-breeding in New South Wales. His description of his visit to New Zealand was an important factor in its being proclaimed a British colony, and attracted the early settlers. No doubt this gift, and the earlier importations, largely

determined the extension of the breed. It certainly proved a wise choice; but it seems strange that a purely British colony should have adopted an absolutely foreign breed of sheep.

In 1807 Marsden carried some of his own wool to Leeds, where he had it manufactured. He had the satisfaction to learn that it was considered equal, if not superior, to that of Saxony or France. His private letters abound with intimations that before long Australia would become the great wool-producing country to which the English manufacturer would look. He was introduced to King George the Third, and took the liberty, through Sir Joseph Banks, of praying for a couple of Merino sheep, His Majesty's property, to improve the breed in Australia. His last letter from England, dated from the Cowes Roads, mentions their reception on board. He wrote, "We are at this moment getting under weigh, and soon expect to be upon the ocean. I have received a present of five Spanish sheep from the King's flock, which are all on board. If I am so fortunate as to get them out, they will be a most valuable acquisition to the colony."

In his "Life of Sir Joseph Banks" Edward Smith, F.R.H.S., makes this interesting reference to Captain Macarthur: "Telling his own story at the Office of Trade, he convinced the Committee that there was a great future in store for New South Wales. The statistics which he offered would show them the possibility of supplying England with any quantity of the finest wool that she required. And he was determined, on his return home, to devote his entire attention to the subject. The support of persons interested in the matter soon became highly encouraging. He went home having apparently converted everybody. The Government made him a new grant of 10,000 acres. He took back with him five Spanish Merino sheep which he had bought at the King's sale in 1804, and a number of plants and fruit-trees. He now became the leading planter and agriculturist in the colony, extending his operations constantly, and adding largely to its prosperity. Hence Macarthur came to be called the real founder of New South Wales. A friendly competitor was the Rev. Samuel Marsden, chaplain and Magistrate. Governor King describes him to Banks as the best practical farmer in the country. In 1804 he owned twelve hundred sheep, and held 1,720 acres. He wrote a few letters to Banks with encouraging views of sheep-breeding, and proposed experimenting with Leicester and Lincoln sheep, two rams of which he had instructed his agent to export."

A footnote on the same page of the book states, "The prosperity of the King's farming is well shown by the prices given by



A Scene at Shearing-time on a Back-country Sheep-farm.

Macarthur: £6 15s., £11, £16 16s., £23 2s., £21, £28 7s. The heaviest fleece weighed 7 lb. 2 oz. Banks also gave some heavy prices at this sale."

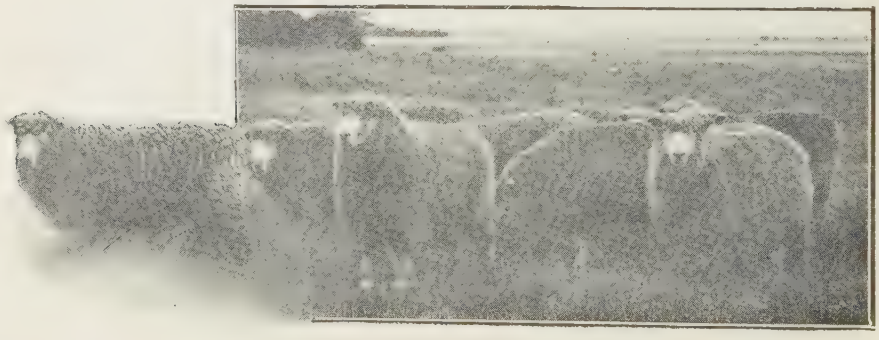
No development-work is recorded as having taken place in New Zealand for a considerable time. Finally sheep were imported to improve the quality of the sheep descended from the New South Wales importations, at first even from Saxony. Later on Tasmanian blood appears to have been popular, while some flock-owners in North Canterbury, Marlborough, and Hawke's Bay used South Australian sheep. It is not to be wondered at that sheep-owners should have turned their attention to some of the British breeds of sheep, especially as the Merinos, wonderful as they are on hill country, are not successful as paddock sheep, and paddocks rapidly became essential as the system of farming advanced. Border Leicester was favoured in the South, though some breeders

The New Zealand English Leicester.

introduced the Lincoln breed. In the early "sixties" English Leicesters were imported into Canterbury, while at a still earlier date, in 1857, a few Romney Marsh sheep were imported to Wellington, where they fell into the hands of Mr. Ludlam, of the Hutt. The hardy south-of-England sheep were rapidly taken up. This gave the trend to the Romney, which has since become popular and useful in all parts of the North Island. Hawke's Bay favoured the Lincoln as a change. Farmers on the west coast of the North Island, where the rainfall was greater, were later in developing crossbreds on account of settlement being retarded by the Maori wars; but there too the Lincoln breed predominated at first, though it has been largely discarded of later years in favour of the Romney. The returns from Lincoln were at one time very large, not infrequently a flock averaging 10 lb. of wool, this realizing 1s. a pound; but as the wool became coarser the value of it declined.

As the country was broken in and the bush-clad hills converted into pasture the Lincoln-cross was found to be unsuitable from their not being good foragers, though in rough country where the sheep come in frequent contact with logs and brambles the Lincoln is still favoured, for its wool is not dragged off the neck and bellies as in the case of other breeds. At this time the flocks generally consisted of one-third ewes, the remainder being hoggets and wethers. Sometimes the wethers were kept on for their wool even till they were eight-tooth. The difficulty of rearing the hogget was not solved until the growing of winter food was adopted. With the continued use of purebred sires the flocks in the lower country became well bred, in the sense that they were nearing the purebred standard of the British breeds. In many cases the losses became so considerable during winter that some breeders adopted the Australian custom and used the Merino sire, the progeny being called "Comebacks"; but this was not then generally favoured. What to do with the surplus stock—for there was not much new country being opened up—was a difficult problem, and big fat wethers were sold for 8s. for boiling down, although but a few years before they were worth £1 a head owing to the supply being then less than the demand. This went on for some time. The price of wool then fell, and there were dolorous times indeed till science came to our rescue.

At a somewhat earlier date Mr. Mort, of Sydney, a far-seeing and public-spirited man, had tried to solve the difficulty of carrying mutton carcases whole to London with the assistance of ice, but this failed, and nothing came of the principle until a firm of engineers, the Bell-Coleman, perfected the cold-air process. This process was eagerly watched by those who foresaw the great future it implied for the disposal of our fat sheep. The late Mr. Thomas Brydone, of the Australian Land Company, in Otago, and the late Mr. John Grigg took the foremost part in bringing the first vessel



New Zealand Lincolns.

The Romney Flock at the Weraroa Experimental Farm.

fitted with refrigerating machinery out to New Zealand in the year 1881. The carcases were conveyed on board and were frozen. The result was successful, even though the expenses were high. Freezing-works were subsequently established in Otago and Canterbury, and a great impetus was consequently given to sheep-farming. Especially in Canterbury was this the case. English Leicesters rapidly came to the front in that province—the old compact type with symmetrical bodies, short in the leg and early fattened; they were quite unlike the breed as I saw it later in England, where the exhibits were great leggy, bony sheep. Very soon it became a practice to breed many half-bred ewes from the hill country to the English Leicester, and freeze the lambs. The Canterbury Province was ideally situated for this policy—Merinos in the higher country with half-breds on the downs and English Leicesters on the fattening-country on the plains—being assisted by a good climate and plentiful sunshine. Canterbury lamb sprang into fame, and deservedly so, for it was beautifully grown and fattened. The short, plump leg of mutton was most attractive, and at Smithfield it vied with the locally grown lamb for place, though there was a distinct prejudice against it on account of its being frozen.

The whole aspect of things was changed with the establishment of an export trade, and more and more crossbreds were grown. Canterbury lamb held its own for many years, though Otago also exported lambs of good quality. The North Island was long in following suit, several factors being responsible for this. In the first place the railway system was very backward. In Canterbury and Otago the railway ran through the fattening district. In the North Island there was no railway at all to the west coast, and although the Wairarapa was connected with Wellington the Hawke's Bay Province was cut off.

Eventually freezing-works were started, and they made good progress from the first, yet the circumstances were quite different from those in Canterbury. There were no half-bred ewes, which in Canterbury were found to be such good mothers and whose lambs fattened so early. The ewes were large, and those of the Lincoln breed—in which the production of the heavy fleece makes a considerable drain on the animal economy—were indifferent mothers. The sheep frozen for a long time were mainly wethers, and the lamb trade was practically left to the South Island. A few breeders, however, who used Southdown rams entered into the lamb trade with success. As a result of their example the practice of using Southdown rams on long-woolled crossbred ewes for fat-lamb production soon became general. At the present time the whole of the southern end of the North Island continues to breed and fatten

lambs to a considerable extent. In certain suitable districts a Canterbury system has been adopted. This is the buying of ewes and fattening both the lamb and ewe, thus spelling the paddocks in the winter-time to enable the process to be continued the following year.

Merinos have fallen away very much in numbers, and are now, alas, a remnant of what they were. Whenever a crossbred can be reared a crossbred takes the place of the Merino. The ideal position in Canterbury is changed. No longer can the low-country farmer procure half-bred ewes unless at a very high price, and this has undoubtedly affected the quality of the bulk of the lamb exported from Canterbury. Still Canterbury lamb is quoted at a higher price on the London market than any other brands. Breeders, however, foresaw that when the supply of merino mothers was not available the half-bred ewe went to the English sire.

Manawatu Romneys.

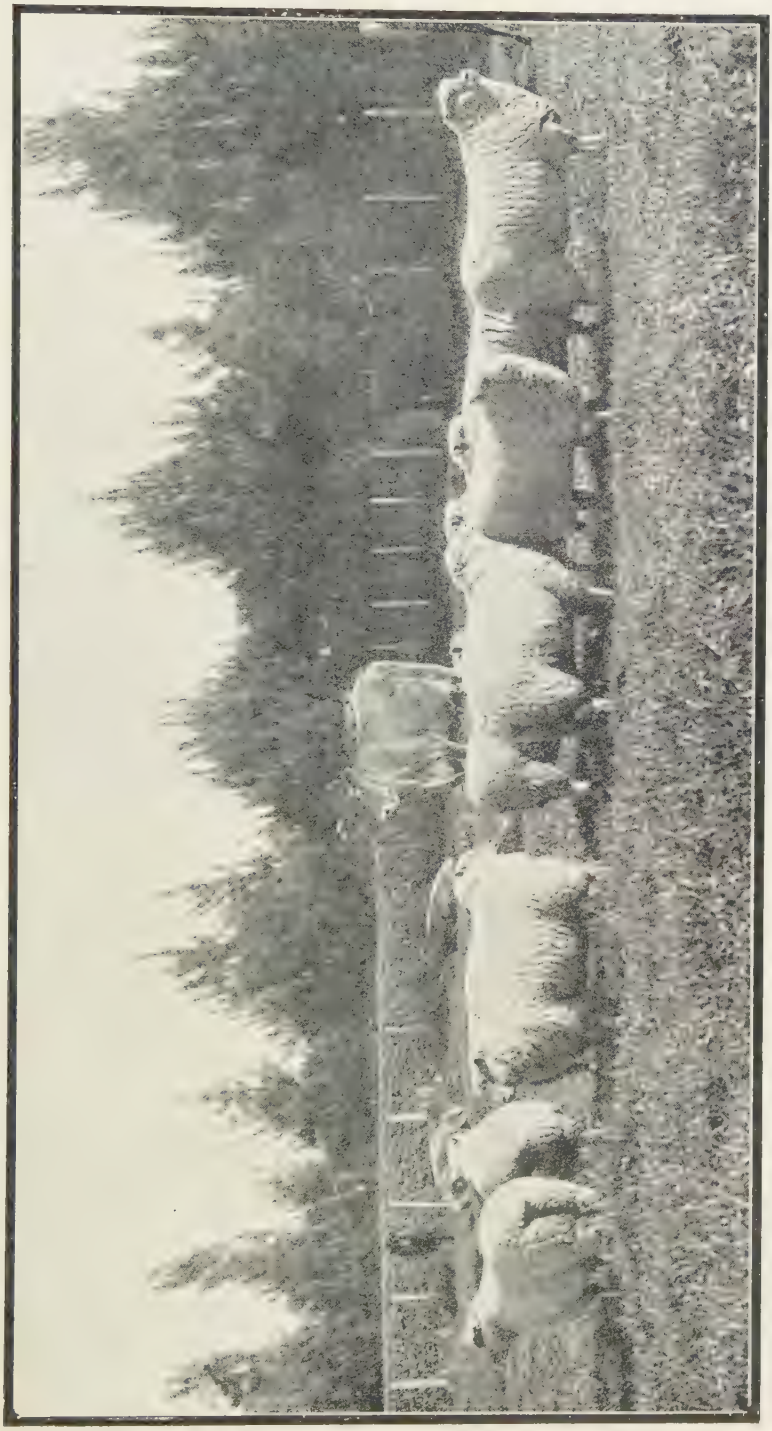
How were they to be replaced? A new breed of sheep was evolved—an inbred half-bred. It was named "Corriedale," after the name of the property in the Oamaru district on which it was first bred. "Corriedale" is a made-up word, because in reality "corrie" means a cleft or dale on the mountain-side. The half-bred ewe was bred to the half-bred ram, and, with severe selection, turned out a very good sheep. They were again used on the run flocks, to perpetuate a breed akin to the original half-bred which had done so much for Canterbury. The wool of the half-bred sheep has not been mentioned, but it may be said to be the most elastic and attractive wool on the market, always selling at better prices than any other, saving that of the Merino, the limited supply of the latter causing the greater price. One feature against the Corriedale must be mentioned. The basis of many of the flocks was different. Some began with an English Leicester-Merino foun-

dation, some with a Lincoln or Border Leicester, but a sheep has been evolved which is most serviceable in many districts and which is finding favour in the States across the water, and is now being inquired for from the United States of America.

Another system which has many advocates, and which has also been successful, is the use of fresh rams, which are bred by the mating of a purebred long-wool to a purebred Merino. The first-cross sheep of any two breeds is perhaps the hardiest and most attractive sheep that can be obtained. Especially so is this the case when the male is a long-wool. The density and bulk of fleece of some rams exhibited in Canterbury, by Lincoln rams from Merino ewes, is remarkable. One difficulty in this case is that two purebred flocks have to be kept, and there is often a slight variation in the two parent flocks. These flocks may also slightly change in character. If so, their progeny will share in this change, but in a lesser degree. This is, however, common to all flocks. If the Corriedale and half-breds continue to hold their own as time goes on—and it seems likely they will—it is to be expected that, as in the case of other breeds, those who have a genius for breeding will maintain the character and quality of the breed, and those who have not will fail to a greater or lesser degree.

These sheep have to some extent been used in other provinces as well as in Canterbury to check the tendency to get too close to the purebred long-wool where the latter is not suited to the country. The mating of two distinct breeds is not uncommon, and by a process of evolution a new breed is established. The Hampshire Down is said to be the cross between Southdowns and the horned sheep from Wiltshire, and the Oxford Down a cross between the Southdown and the Cotswold. The use of half-bred Cheviot and Leicester rams is by no means uncommon. The advent of the Corriedale and the half-bred has to some extent supplied the lack in this country of half-bred ewes for use in the lamb trade, but the supply does not equal the demand in Canterbury, and many ewes are bought in Southland and the North Island for that province.

The number of sheep per acre carried in New Zealand is a most difficult matter to gauge. The best of our bush-country hills will carry three sheep or about two ewes to the acre, some a little more; but it would be probably exceeding their carrying-capacity. The best flat country I know to fatten lambs on grass has done three ewes and their lambs well. There were 120 per cent. of lambs, and 80 per cent. of these went off their mother; the rest were fattened on the grass. But it is very little of New Zealand that will do this, and the season when the return in question was obtained



Southdowns at the Ruakura Farm of Instruction

was an exceptional one. So much depends on the season as to the way the lambs fatten on their mother that it might be misleading if any percentage were given. The amount of sunshine governs the percentage to a large extent. A dripping season means watery grass and a colder temperature, therefore more fat is required by the lamb to maintain its normal heat. Sunshine matures the grass, and in warmer weather the animal lays on more fat.

The average weight of wool per sheep of the different breeds in New Zealand is very difficult to arrive at. In Dalgety's admirable review of the statistics of wool for the year the average weight per sheep is given as 7·88 lb., while that of the whole world is given as 4·75 lb. Taking the number of pounds of wool and dividing this by the number of sheep in the Dominion gives just about the amount stated, but the estimate is hardly accurate.

Border Leicesters.

A great many lambs are born and shipped before the returns are made up; yet, while their wool is included in the statistical total, the lambs themselves are not added to the number of sheep. Were they included the average wool per head would possibly be not more than 7 lb. I asked one of the early settlers on some very good land near Palmerston North how much wool he took off the acre, and he said, "When I first put sheep on I carried seven to the acre, and they shore 10 lb. of wool; now, after some ten years, I only carry four sheep, and they shear 8 lb." A Lincoln crossbred flock will probably average 10 lb., and a Romney crossbred flock 8 lb. Of course there are many flocks that may do more. Leicesters would give a little less, and Downs, of course, less still. When it comes to Corriedales and half-breds, it is such a controversial point as to how much weight these will clip that perhaps it is unwise to speak of weights at all. My own experience has been with "Comebacks," or Merinos on

Lincoln ewes, the opposite method of crossing to that adopted with the special Canterbury breeds. I found that the weight of wool of the flock was very materially reduced. Although the fleeces themselves were, in the case of rams, enormous in bulk, these weighed disappointingly; while the wool was so elastic that it was with the utmost difficulty the bales were made to weigh $2\frac{1}{2}$ cwt.

Some alarm is felt about the future supply of ewes, but a country such as ours, which can increase its flocks and still go on exporting over six million carcases of mutton and lamb, will, I think, be able to breed enough ewes—so long, that is, as there is not a sudden change from dairying, when the demand would automatically increase and bring about an inflation in prices. If prices rise too high the ewes will have to be kept on another season, though this means more losses and less profit. The future is full of promise. Sheep-breeding is the principal industry of the country, and there is nothing at present in sight to indicate that it will not retain its pre-eminent position.

THE DEVELOPMENT OF THE NEW ZEALAND SHEEP INDUSTRY.

Year.	Number of Sheep.	Number of Carcases Mutton and Lamb exported.	Value.	Wool exported.	Value.	Total estimated Value of Live Sheep exported, Sheep slaughtered for all Purposes, and By-products.
			£	lb.	£	£
1882 ..	12,985,085	30,488	19,339	65,322,707	3,118,554	3,740,943
1887 ..	16,564,595	706,967	444,747	88,824,382	3,321,074	4,561,521
1892 ..	18,570,752	1,768,055	963,853	118,180,912	4,313,307	6,238,960
1897 ..	19,673,725	2,209,969	1,459,596	135,835,117	4,443,144	7,009,740
1902 ..	20,342,727	3,144,716	2,190,636	160,419,023	3,354,563	7,094,449
1907 ..	20,983,772	4,833,608	2,864,460	171,635,595	7,657,278	12,483,738
1912 ..	23,750,153	4,897,398	3,499,075	188,361,790	7,105,483	13,100,558
1914 ..	24,798,763	6,376,615	4,454,446	194,493,773	8,244,757	16,099,703

Taking the Clip to Market.

NEW ZEALAND AGRICULTURE.

THE RELATION OF THE STATE TO AGRICULTURAL ADVANCEMENT.

F. S. Pope.

It was realized even in the earlier days of the history of New Zealand that in a country so richly endowed by nature for agriculture the primary industries would necessarily become the chief sources of national wealth; and when, with the advent of the ocean-going steamer and the perfection of the refrigerating process, an oversea trade in perishable produce was made possible, rural industries received an impetus which rapidly justified their extended prosecution and assured their permanent success. Far-sighted politicians soon realized that if the smaller farmer especially was to compete successfully on critical oversea markets he had to be encouraged to aim at the exportation of nothing but high-grade produce.

Certainly in those days little was done to educate the wool and mutton producer, but fortunately sheep-farming was largely in the hands of progressive men, assisted in the main by British shepherds who brought to the Dominion a sound knowledge of the principles which have made British producers of live-stock famous throughout the world. The health of sheep has been carefully safeguarded by the State—indeed, the first action taken by a New Zealand Government in the direct interests of the farmer was to fight in a drastic manner an outbreak of scab, and this with such good effect that the disease was entirely stamped out. By means of a highly qualified veterinary service, supported by stringent regulations, contagious disease is controlled or kept out of the country, and at the present time New Zealand is remarkably free from serious disorders of live-stock, such troubles as foot-and-mouth disease, glanders, anthrax, tick-fever, and scab being entirely absent. Inspectors are employed to see to the enforcement of regulations which have for their objective the ensuring of sheep being kept free of parasitic life, and cattle affected with disease being slaughtered instead of being offered for sale to unsuspecting neighbours. Cattle affected with tuberculosis must be destroyed, but compensation up to half the value of the animal is given the owner who reports the

presence of the disease. Meat both for local consumption and for export is examined by qualified men. In a well-equipped pathological laboratory diseases of stock are investigated under the direction of a highly qualified officer.

The dairy industry, the chief activity of the small farmer, has been sedulously fostered for many years past. In the early days of colonization dairy-farmers were encouraged to form co-operative manufacturing companies. Experts were appointed as guides in these undertakings—to inspect sites for the manufacturing-depots, to provide plans, to give instruction in most approved methods, and to grade the produce prior to exportation. The first-class butter- and cheese-making establishments in operation have been a great factor in the development of the valuable industry the milk-producers of the Dominion have built up. In more recent years the State dairying service has developed the important work of herd-testing. By means of model herd-testing associations milk-producers were encouraged to form co-operative testing societies in the chief dairying districts; while the herd-book societies controlling the interests of the main dairying breeds were persuaded to establish official registers of merit, in order to make thoroughly effective the campaign of advancing productive power by breeding according to performance. The State service has been instrumental in bringing about the making of butter from the cheese-factory whey, which was formerly allowed to go to waste, and has aided the casein industry by grading this product from the initiation of the industry.

The farmer in general is assisted in the adoption of improved methods and the solving of local problems by means of six experimental farms, three of these being mainly concerned in fruit-testing and demonstration-work. Noteworthy has been the good service rendered by the principal farms in demonstrating the right methods of advancing the productive character of dairy stock. The growing of lucerne in soils and environments formerly considered inimical to the success of this plant, the value of green-manuring in creating humus in light soils in a country where stall feeding is almost unknown, and ascertaining by extensive and repeated tests the best varieties of plants suitable to different districts, have been some of the principal phases of activity. Plant-breeding work is also in active progress at two of the farms, and in one conspicuous case the Ruakura Farm of Instruction has selected an oat of high-grade quality which is rust-resistant in the district and in many other localities at which it has been tested. At three of the farms cadets or learners are provided for, so that youths

desiring to secure a sound training in agriculture may do so at practically no cost to their parents.

When the development stage of the experimental farms was practically past—in several notable instances they were established under conditions demanding great expenditure of time and money to bring the inferior land of the sites selected to a usable state—it was realized that something more was required to induce the great majority of the men on the land to adopt improved methods. The co-operative field experiment was decided upon as the best means to this end. Special officers were appointed, and, with the assistance of the Field Inspectors, are laying out and supervising trials on many farms in different parts of the Dominion, just on nine hundred farmers having co-operated with the Department in this important work last season. By means of the results obtained the Inspectors in question are becoming possessed of much information invaluable for the districts in which they are located, acting the part in many instances of advisers to the farming community on all matters affecting crop-production. These officers also administer the law under which the control of the rabbit and noxious-weeds pests is compulsory.

The industry of fruitgrowing is being fostered in a liberal manner. Diseases injurious to the plants of the orchard and garden are rigidly excluded from the Dominion, while strict inspection is in force to ensure that orchard pests are properly controlled within the country, so that the fruitgrower who conducts his business on approved principles may be fully protected in his enterprise. Instructors are engaged to introduce the latest methods of orchard-management and to conduct spraying demonstrations, &c., while all fruit exported is officially inspected for freedom from disease and classified according to quality. In order to stimulate an export trade the Government has up to the present guaranteed shippers against loss; and to ensure that the fruit is held at a proper temperature prior to exportation, and to encourage growers to feed local markets in a proper manner, the State has now enacted legislation providing for the advancement of sums of money to societies of growers for the establishment of cool-storage works.

The testing of agricultural seeds is conducted by the Biologist and his staff. This officer also undertakes the identification of botanical and entomological specimens, including diseases of plants.

The farming community has at its command the services of an agricultural chemist.

Beekeeping is also being liberally encouraged. An Apiaries Act empowers district Inspectors to destroy all hives found affected

with foul-brood. These Inspectors are also capable instructors, and in addition to their other duties grade all honey prior to exportation.

The poultry industry is fostered by means of two poultry plants, which breed purebred utility stock according to laying-capacity, and sell settings of eggs of these and stock birds at moderate rates. A Poultry Instructor is also employed to lecture and give demonstrations on modern methods of poultry-keeping.

The hemp industry (the production of fibre from the *Phormium tenax* plant) is fostered by means of Instructors and a grading staff which classifies all fibre prior to exportation. Recently a Government bonus of £12,000 was offered for an improved system of treating the fibre in order to make it of higher commercial value.

The Department issues a monthly publication. This *Journal of Agriculture* takes the practical advice of its experts and the lessons gained on the experimental farms and from co-operative experiments direct to the farmer. That the monthly *Journal* in its present form is popular is proved by the fact that within the four years of its existence its circulation has reached nearly seventeen thousand copies, of which over fifteen thousand go to paying subscribers. In addition, bulletins on special subjects are periodically issued.

New Zealand producers are also assisted by the State on the British markets, the principal outlet for their produce, the High Commissioner in London having a special staff, including several experts, for superintending the handling and distribution of their produce. Trade Commissioners are also located at San Francisco and at Melbourne to safeguard on those markets the interests of New Zealand exporters.

New Zealand, the land of paradoxes, of snow-clad alps, volcanoes, mountain lakes and magnificent rivers, dense forest, undulating downs, and rich and fertile plains; the southern paradise for the artist, the pastoralist, and the agriculturist; the land of variable climate, good harbours, big public and private debts; the land which has made the fastest pace in the race of civilization of any country or people in the world. This last act is attributable to her rich, fertile land, her great pastoral and agricultural industries, and to the efforts of a class of the best colonists that ever settled any country in the world. The climate is one of the most variable, and is at the same time most strictly temperate, both summer and winter. Within the greatest portion of the colony the grass never ceases to grow all the year round. —*J. Clarence McIvor.*

HORSE-BREEDING IN NEW ZEALAND.

In a community of British farmers, such as that of New Zealand, it is only natural that to breed or to own a good horse should be a popular desire. Horse-racing is the national pastime, and horse-breeding is a hobby as well as a business. There are many fine horse-breeding establishments in the country, but the majority of the horses annually produced are bred by working-farmers and small breeders. The thoroughbred of New Zealand is of outstanding quality, founded as it has been on the best British stock. One world champion at least has been bred in this country—Carbine, the sire of Spearmint, a son, produced after Carbine was purchased by an English breeder, which made himself famous by winning the English Derby and the Grand Prix de Paris. The trotting-horse is bred to a good standard, the best American blood having been imported for the purpose, especially by breeders in the Canterbury Province. The draught stock of the Dominion is of an excellent stamp. The Scottish Clydesdale and a strain of this breed containing a dash of Shire blood are the dominant types. The horse in which activity is combined with substance is the animal most favoured.

New Zealand is fortunate in possessing breeders of horse-flesh who are willing to pay high prices in order to secure the best blood in the world for foundation stock or for improving their studs. This combined with the exceptional environment presented by New Zealand for the production of live-stock has enabled horses of all types to be bred to a very high standard.

HORTICULTURE IN NEW ZEALAND.

W. H. Taylor.

Although the art of horticulture in New Zealand has not as yet reached the high standard that has been attained in older lands, it has, for so young a country, made very satisfactory progress. Having but few citizens of large incomes, the purely ornamental branch is yet in its infancy. We have not the glass structures of palatial proportions that are common in the Old World. But nature has made large tracts of this new land one vast conservatory, with the vault of the heavens as its dome. Over a very large part of the North Island the climate is so mild that plants grown in most parts of the world only in heated structures here flourish in the open air, in a manner not to be achieved by the most skilful management under artificial conditions. In parts of Hawke's Bay and northward bougainvilleas, mandivilleas, and plants of a like nature flourish in an astonishing manner. A plant of bignonia may be seen covering a veranda-front fully 40 ft. long, and *Bougainvillea glabra* in equally large masses. Camellias, and azaleas of all classes, are of course quite hardy. Other tender plants that are cultivated in the open air include bouvardias, pleroma, rhyncospermum, libonia, justicia, *Makaya bella*, ericas, epacris, Japanese maples, &c. In many parts, notably in the Auckland Province cinerarias are freely used as bedding-plants, and flourish amazingly. In a country endowed with such a climate, and with rich soil, it may be expected that phenomenal growths occasionally occur. This is not infrequently seen in lilies with extravasated stems, the heads sometimes carrying nearly two hundred flowers. These are *Lilium auratum;* and it is notable that in the gardens of the late Mr. Thomas Mason, at the Lower Hutt, Wellington, these lilies were annually seen 10 ft. and more in height, with stems strong enough without stakes to bear the weight of a number of enormous flowers. These gardens, which included 7 acres of ornamental planting, were, while the late Mr. Mason cared for them, the finest in New Zealand, containing the most extensive collection of trees, shrubs, and flowering-plants in the Southern Hemisphere — giant olive-trees; conifers from all parts of the world; the maples of Japan grown to the dimensions of trees; the tea-plant in robust health; and the world's choicest flowering-shrubs. The best of New Zealand trees and flowering-plants are there associated with those of other climes.

Clematis indivisa may be seen, throwing a mass of white blossoms on the branches of a Norfolk Island pine, after climbing its trunk for fully 40 ft. The Australian acmenas, like gigantic myrtle-trees, are not the least beautiful denizens of these gardens. These gardens, too, were wont to produce the largest of large rhubarb and asparagus.

The Dominion is fortunate in possessing a large number of amateur enthusiasts, who, though their individual operations are necessarily small, exercise a powerful influence on New Zealand horticulture. The queen of flowers, the rose, has many votaries, some of the more wealthy enthusiasts growing large numbers, and growing them well. The Hon. E. C. J. Stevens was, perhaps, the most notable pioneer in this work. The temperate climate of most parts of New Zealand renders rose-growing easy. We have no need to bandage our buds to protect them from frost, nor to cover the soil above the roots with ashes or litter. Nor must we perforce bud on a hardy stock. On the contrary, it is probable that there are more own-root roses grown than budded specimens, the latter method being adopted mainly as a trade convenience. Roses all the year round is an actual fact in all but a few districts. All that is needed is bushes of certain kinds of teas or Bourbons, and the observance of a masterly inactivity in the matter of pruning, and we have roses in winter and in early spring, where in colder countries they are nothing but sticks. The old story about clay for roses is not very convincing here. Quite the best roses I have seen were growing in comparatively light soil, but it was deep, and consequently held a good reserve of moisture.

The queen of the autumn, Madame Chrysanthemum, has had enthusiastic admirers for many years. Again the amateur grower has been much in evidence. I think it safe to say that our most accomplished grower is an amateur, for, using the word in its narrow limitation, he is not a professional gardener. Pot-plants that would be a credit to any expert have been produced, and blooms fit to grace any showboard in the world. Although I mention amateur growers first, the gardeners have also done their share. One man at least grew flowers good enough to send to England enclosed in blocks of ice.

Carnations of perpetual strain flower in the open throughout the year, the great blow having of course its period as elsewhere. Enthusiasts have been working with carnations for many years, and quite good and distinct varieties have been raised from hybridized seed.

Sweet-peas have their cult in this country as a matter of course, and are grown to a fine state of perfection. Quite wonderful things sometimes happen to sweet-peas in the garden. I say "happen" advisedly, for it is the climate, and not the grower, that enables

them to flower in summer and autumn, survive the winter, and produce a marvellous display in spring. I have memory of a surprise I had on seeing the wall of a building clothed with a mass of mauve flowers, which on closer inspection proved to be sweet-peas: they were at least 14 ft. high, and flowering from near the ground to the top. This case was singular only because peas seldom have an opportunity to climb so high, being more frequently on sticks or strings, and after reaching the top they droop down.

Maidenhair Fern grown in New Zealand by W. H. Taylor.
Height, 4 ft. 9 in.; breadth, 5 ft. 6 in. Untrained natural growth.

Flowering in two seasons is easily brought about by sowing early in November, instead of in March or early spring, which are the usual times of sowing.

The public gardens in the chief centres of population are popular places of resort, and now that shelter-trees have grown up, lend themselves to the art of the horticulturists in charge, who are taking advantage of their opportunities in a very satisfactory manner, so that these gardens are fast becoming places of considerable horticultural interest and beauty.

Horticultural societies are very numerous in the Dominion, bearing witness that the horticultural interest is strongly imbued in the people. The very large number of small exhibitors is further evidence of the influence of the pursuit in the home life of the people. Our exhibitions are, of course, of a different character to the wonderful displays in older countries. Country-town shows are mainly of the cottager order so far as concerns pot-grown plants. Fruit, flowers, and vegetables are, however, of a very high order of merit. The large provincial fruit-shows are magnificent displays. The excellence of the fruit and the number of entries are probably not surpassed in any country.

In respect to vegetables, a different standard of merit to that sought in English shows is recognized here. We see pumpkins weighing nearly a hundredweight and a half, cabbages 35 lb., cauliflowers a dozen pounds, and cattle-carrots 10 lb. and 11 lb., other things in proportion. This may not be pleasing to critical eyes, but at least they bear testimony to the fertility of our soil, for they are but seldom the result of special effort, our people being mostly too busy to devote time to special preparations for shows. In the large towns the exhibits of vegetables more nearly approximate to the Home standard, for there the influence of professional gardeners with European experience is more felt.

At these shows, also, a different class of exhibits in other sections are usually put up. Influenced still by the lack of wealth, there are not the profusion of plants of high value, and a dearth of heated houses limits the variety. Our mild climate, however, gives more possibilities to unheated houses, and makes possible what can only rarely be achieved in most countries. Thus we see cinerarias 3 ft. through the head of the flowers, and the hardier adiantums of very large size. Wellington shows have seen a specimen of *Concinnum laetum* 6 ft. in diameter and over 5 ft. high; concinnum, 4 ft. diameter; tenerum 3 ft. and *Asmunda regalis* 8 ft. high. In the cut-flower sections very large and fine displays of open-air flowers are usually seen. Narcissi, roses, and sweet-peas are perhaps as good as anywhere, while the best of our chrysanthemum shows are good enough to satisfy the most critical.

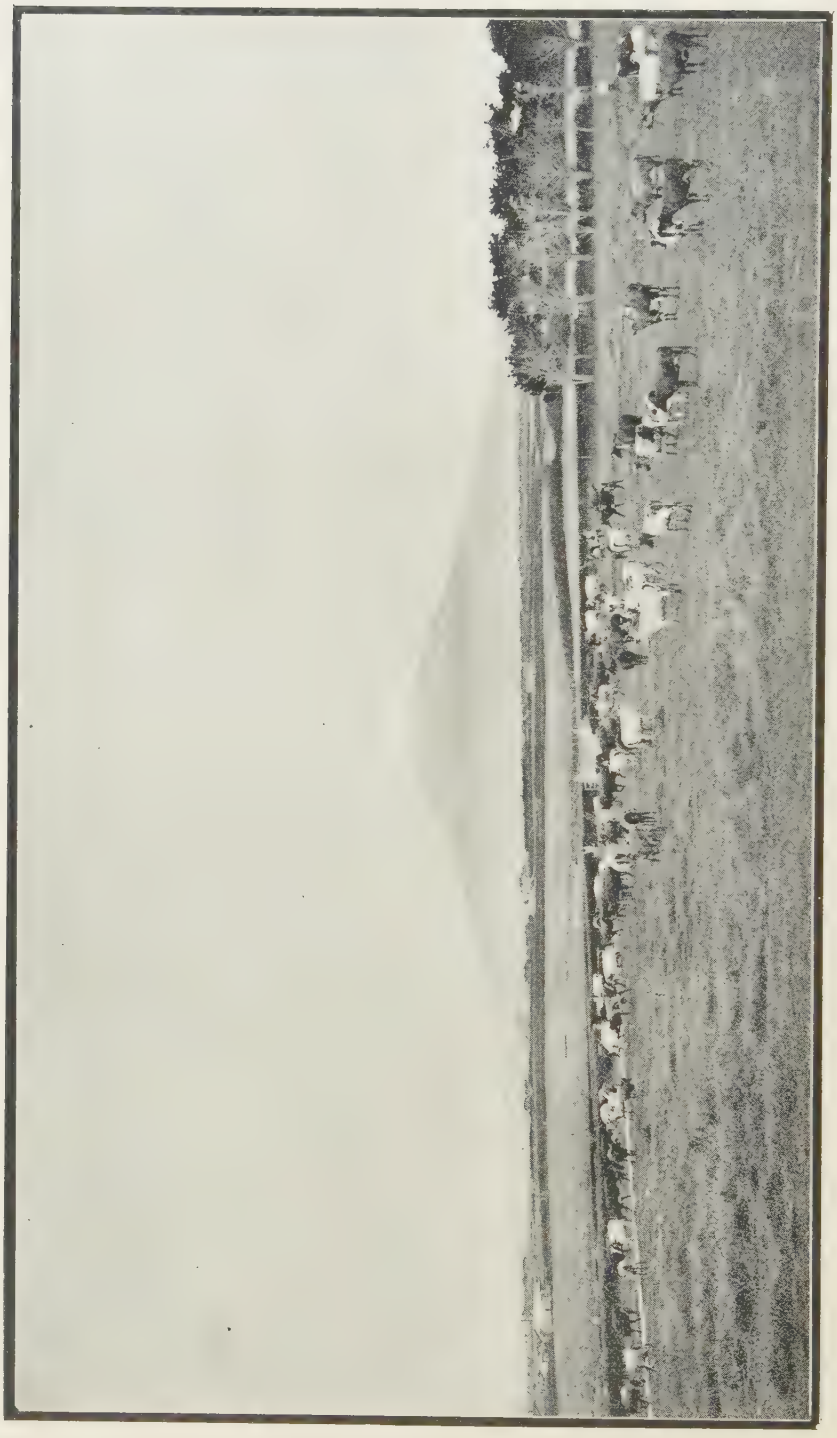
On the utilitarian side, the trade of the Dominion is well catered for by a large number of skilled growers. Farmers contribute to the supply to some extent by growing large breadths of cabbages, onions, carrots, parsnips, pumpkins, &c., as an adjunct to their main occupation, which is mostly dairy-farming. It might interest many in Europe to know that the peas they sow were in all probability grown in New Zealand. In the Marlborough Province large areas, amounting to hundreds of acres, are sown in peas

grown under contract for English firms. The climate is peculiarly adapted to the perfect ripening and harvesting of the seed. Strange as it seems, it is nevertheless true that peas are imported from England that were grown in New Zealand, and come back here again to private growers. Among those who devote themselves to growing vegetables, &c., for the market are many clever men. Some have been to Europe to learn certain branches of the work, particularly the forcing of fruits and vegetables, cucumbers, tomatoes, &c.; others have graduated by their own industry and intelligence, working up from small beginnings till now they are masters of quite considerable concerns.

Well-managed houses of grapes, cucumbers, and tomatoes are increasingly numerous in the neighbourhood of most large towns. One of the largest forcing establishments is at Lower Hutt, Wellington, and comprises some dozen houses, each 200 ft. long and 40 ft. wide. There French beans, lettuces, &c., are grown in addition to the lines mentioned above. Others confine themselves to open-air culture, and some, who are masters of their business, secure very handsome returns.

The vegetable-market finds employment for a large number of Chinese, who are certainly an industrious people and appear to find it a lucrative occupation. The system the Chinese gardeners adopt to maintain a succession of vegetables is a very simple one. They are continually sowing and planting the all-the-year-round varieties, so that they have them in all stages of growth, and, although the system is naturally subject to some wasted effort and failures, it is undoubtedly the best they could follow, however ill-suited it might and would be to the purposes of European and colonial growers. It is quite a mistake to suppose that Celestials produce the greater part of our vegetable-supply: they not infrequently sell produce they have purchased from a white grower.

Nurseries are keeping pace with the general development, and some of the larger are quite a respectable size. One establishment I am acquainted with in Hawke's Bay comprises 40 acres, all closely stocked and maintained in very high order of excellence, not only as to quality of the stuff grown, but also in economical arrangement and general cleanliness. This nursery was at a recent date employing eighty pairs of hands. This place, though larger than most, is typical of many others throughout the Dominion. The nurseries, as in other countries, are many and various, dwindling in size till we have the man with a small house who grows a few thousand tomato-plants for the "trade," and he who grows a few lines of seedling *Cupressus macrocarpa* and nothing else, being perhaps a shoemaker or labourer.



A Scene in Taranaki.

OUR DAIRY BREEDS ON YEARLY TEST:

THEIR DEVELOPMENT AND PROSPECTS.

W. M. Singleton.

The dairy herds of New Zealand must number some 725,000 cows, and the value of their production is conclusive evidence that they are of very great importance to the Dominion's agriculture. Of the various phases of agriculture practised in New Zealand to-day the dairy cow is responsible for the fact that on suitable farm areas no industry can profitably compete with hers. She is therefore "Queen of Agriculture," and Agriculture, according to Ruskin, "is the lord of all the occupations and arts of men."

I believe that for distinctive dairy breeds there is in New Zealand a fine future. There is room for a great increase in numbers and considerable improvement in general quality, which will keep an enthusiastic breeder too busy to find time for any jealousy towards partisans of breeds other than his own. Some twenty thousand prepotent purebred dairy bulls would be needed in New Zealand to-day had we the ordinary dairymen educated on the principles of breeding. With such scope breeders cannot afford to do anything which will prejudice any dairy breed. Any such action reflects on all purebred dairy stock. It must be recognized that purebred animals of any of the dairy breeds are good property for a dairyman, provided that such animals are of deep-milking strains.

The North Island agriculturists devote their attention more exclusively to dairying than do the farmers of the South Island. It is only natural therefore that, although dairying is a prominent phase of agriculture in the South, the use of purebred dairy bulls is more general in the North. Such being the case, the majority of the breeders of purebred dairy cattle are in the North Island, where the distinctive dairy breeds have extended much more rapidly and have become a great deal more popular.

Jerseys.

The Jersey seems to have found in New Zealand a favourable environment. Since the commencement of the dairy industry on an organized factory system her pride of place amongst our dairy

breeds has only recently been challenged. She is an animal whose beauty of form and type make her an object of admiration. Many dairymen have also proved that great capacity as a butter-fat producer often goes with her excellence of form and beauty.

For many years the dairy industry of New Zealand recognized butter as its principal manufactured product. The Jersey was frequently termed the "butter cow," but possibly this term was more applicable before the days of the centrifugal separator. The first volume of the Jersey Herd-book proper was issued in 1903, although a number of pedigrees were published in a herd-book for "breeds other than Shorthorns" in Canterbury in 1886, and again later, in 1891. Volume xi was published during the present year, and the Jersey Herd-books of New Zealand now contain the pedigrees of 2,898 bulls and of 3,708 females, while the association numbers 298 members.

Some good stock was brought to this country in the early importations, and a number of the Jersey-breeders who have been longest engaged in this work in New Zealand have vivid recollections of some of the best of the breed during the earlier days. Even at that time these animals were highly prized.

The majority of purebred bulls at the head of our herds are Jerseys, and this has been the case for many years; although the Jersey may in future find this premier position more difficult to maintain.

Holstein-Friesians.

During the past decade the Holstein-Friesian has attained very considerable popularity in New Zealand as well as elsewhere. Being a large-framed cow she suits a number of our dairy districts specially well, since she is capable of converting large quantities of rough feed into that much-prized product, milk. The trend from butter-manufacture to that of cheese has given her admirers a unique opportunity of stressing her capabilities as a producer of milk for cheese. The exceedingly large yields of the deepest milking individuals of the breed have also advertised the "black-and-whites" in no uncertain manner, and for a time this colour was the means of making any quality of animal popular amongst buyers at the saleyard.

The first importations to New Zealand were made in 1884 by John Grigg, Esq., of Longbeach, Canterbury. These came from Holland, and were brought to our Dominion by the "Waimea." They were transhipped to this vessel in the English Channel, since they could not be admitted to England. From the Longbeach stud animals have been distributed to many parts of the country,

The Champion Butter-fat Cow of New Zealand, Mr. J Donald's Netherland Princess IV.

and the foundation stock of a number of our Holstein herds traces back to the bull and some of the seven cows brought here by Mr. Grigg. That the selection (the work of his son, Mr. J. C. N. Grigg, upon whose advice the importation was made) was sound is evidenced by the popularity of this strain to-day.

Such rapid strides have been made of late that the Holstein-Friesian Breeders' Association now numbers 272 members, and has issued three herd-books. The three volumes contain the pedigrees of 699 bulls and 2,557 cows and heifers.

Until the Department of Agriculture, in 1909, bought from Mr. Grigg, of Longbeach, the nucleus of its Holstein-Friesian herd at Weraroa this breed had acquired very little popularity in the Dominion. At this experimental farm records of production were kept, each milking from each cow being weighed for this purpose during the lactation-period. An annual sale of bulls was instituted, and a new feature in connection with the sales was the announcement of the production of butter-fat by the dam of each bull. The records were good, and the high prices brought by a number of the bulls did much to advertise the "black-and-whites." That there are some really splendid strains of this breed in New Zealand to-day will be apparent from some of the remarks made later on in this article.

Ayrshires.

Ayrshire cattle were perhaps more popular in the early days of New Zealand than were representatives of any of the other distinctive dairy breeds. Residents of Otago and Southland knew the Ayrshire cow in her native land, and it is only natural that these early colonists should import their favourite as soon as the necessary arrangements could be made. The "Philip Laing" is said to have brought out the first bull, which was consigned to the Rev. Dr. Burns, first Presbyterian minister in Otago. Since this first importation, about 1848, Ayrshires have ever been increasing, and the breed is now well represented in both the North and South Islands.

The fourth volume of the Ayrshire Herd-book has been issued, and with it there have been published the pedigrees of 297 bulls and 956 cows and heifers. There is quite a number of purebred Ayrshires in New Zealand whose pedigrees have not yet appeared, but these are gradually being included, and it should not be long before the present number of entries will have been considerably augmented.

It is becoming more generally recognized that the heaviest milkers of any of the dairy breeds are those whose size and weight are above the average of the breed to which the individual belongs. A number of Ayrshire breeders have accepted an undersized animal as their ideal, but this error of judgment is being counteracted in many of our best herds; and the future will doubtless evidence a larger percentage of roomy, well-developed, and heavy-producing Ayrshire cows.

Madam Mayflower.
The leading Advanced Register of Merit Jersey.

Good strains of any distinctive dairy breed will do well at the bucket if on good pasturage. Some breeds can do little if this be not the case, but it has long been claimed for the Ayrshire that she will do better work under unfavourable conditions than will representatives of other breeds. Nevertheless, the Ayrshire does best under good conditions, and some exceedingly creditable work by representatives of this breed is being authenticated. Now that yearly records of butter-fat production are becoming more general in New Zealand we expect to see, in the near future, a marked improvement in the utility type of Ayrshire.

Cow-testing Associations.

Prior to the year 1909 only a limited amount of cow-testing was systematically done throughout the season. In many instances where a certain amount of testing was undertaken no attempt was made to ascertain the number of pounds of butter-fat produced during the season. The weight of milk was considered of less importance than the percentage of butter-fat.

Mr. Cuddie, Director of the Dairy-produce Division, visited Denmark and Canada in 1908, and on his return induced the Department to undertake the operation of an illustration cow-testing association. This association was arranged with the co-operation of the Dalefield Dairy Company in August of 1909, and each successive spring since that time has seen the commencement of associations in the different dairy districts. In all, over three dozen associations have commenced operations in New Zealand, practically all of which are continuing. Many are carrying out the work on good lines, and in all probability the number of cows under test in New Zealand during the present season will reach thirty thousand.

Following the first illustration association in 1909, the Department organized in 1910 three others, in such central dairying districts as Kaupokonui, Stratford, and Cambridge. In 1911 two further movements were organized, one at Whangarei, in the North of Auckland, and the other at Stirling, in the South Island. All of these associations were continued for two years, the Dairy-produce Division doing the testing and figuring, and making no charge to the association members. During the year 1911 three self-supporting associations were conducted—viz., the Thames Valley Dairy Company, at Paeroa; the Raumati Dairy Company, Dannevirke; and another association amongst dairymen around Eketahuna.

The spring of 1912 saw a considerable increase in the cow-testing propaganda. The Department organized three further associations, which operated for one year only. This year was the last in which illustration associations were carried out by the Department. There were, however, no less than thirteen new and self-supporting cow-testing movements conducted and operating during the 1912–13 season. The season 1913–14 saw the commencement of a further thirteen associations, all self-supporting.

The Assistance of the Dairy-produce Division.

Officers of the Dairy-produce Division have taken a keen interest in assisting in the promotion of cow-testing associations. In the

principal dairy districts meetings have been addressed at which the method of carrying out the movement has been carefully explained and the benefits accruing from the work pointed out. Assistance has been given to associations by way of obtaining the necessary apparatus, and frequently instructors have tested the first lot of samples so that the association's testing officer would be enabled to commence on approved lines.

Results of Testing.

The association records of herds which have been on test for two consecutive seasons have indicated a considerable increase for

Holland Queen.

The best mature Holstein in the Certificate of Performance Class.

the average cow, principally brought about as the result of culling and better feeding during the second season. We have records of eight herds that have been in one cow-testing association for four consecutive seasons, and the average cow of the eight herds has increased in production from 225 lb. butter-fat in the 1910–11 season to 277 lb. butter-fat in the 1913–14 season, an increase of a little over 23 per cent.

A number of these herd-owners have some interesting figures, but one owner's records stand out to a striking degree. In the 1910–11 season sixty-seven cows were milked, producing 15,465 lb.

butter-fat, or an average of 230 lb. per cow. On the same place in the 1913–14 season forty-three cows were milked, producing 15,626 lb. butter-fat, an average of 363 lb. butter-fat per cow. With twenty-four fewer cows in milk there was a gross increase of 161 lb. fat and an increased production per cow of 133 lb. butter-fat, or an increase of almost 60 per cent. over the 1910–11 season.

Authenticated Yearly Yields of Purebred Dairy Cattle.

At each of the numerous meetings held during the past five years to discuss the subject of cow-testing association work officers of the Dairy-produce Division have recommended dairymen to head their herds with purebred bulls of heavy butter-fat-producing strain. The difficulty in obtaining such bulls caused many prospective buyers no little concern. Breeders were approached for records, but could give none other than private figures, and even these many were loath to supply. The position became more acute each successive season, until in the spring of 1912 an arrangement for the systematic testing of purebred dairy cows by officers of the Dairy-produce Division was made. During the 1912–13 season the Holstein-Friesian and Jersey Cattle Breeders' Associations adopted the scheme, and the Ayrshire-breeders came in during the season 1913–14. The Milking Shorthorn Breeders' Association, recently formed at Palmerston, has also signified its intention of supporting the movement. Each of the above breeders' associations has adopted a uniform standard of butter-fat requirement.

Since its inception the yearly testing of purebred dairy cows has been enthusiastically patronized. Breeders from the North of Auckland district to the Invercargill district in the South are represented in this work, which has been progressing in a manner that leaves little to be desired.

Forms versus Yield.

Show-yard competition has done much to assist some breeds of dairy cattle, but this has also been responsible for some great divergencies from utility breeding. It is not suggested that the yearly test for butter-fat should prejudice these competitions; on the contrary, and, further, it should assist in keeping out fads and fancies of an unprofitable nature. Good form and heavy production are not necessarily disassociated. A motor-car having a beautiful up-to-date model of a body may have a good or a poor engine; for a reliability trial over a long distance and a rough road the engine is the all-important factor. So in dairying: the year's test is the best indication of the excellence of quality of

those parts of the cow which represent the engine, and of the cow's capacity to "make good" in the reliability trial. While dairymen are well aware that a certain type of body is desirable in a dairy cow, especially from the viewpoint of transmitting this characteristic to her progeny, more importance is to be attached to the engine, or those vital functions which are the criterion of the cow's efficiency in producing butter-fat from the feed consumed.

RESULTS ATTAINED.

The testing of purebred cows has now extended into the third season, and certificates to Jerseys and Holsteins have been granted during a period of fourteen months, and to Ayrshires during a period of some ten weeks, as this latter breed did not commence testing until a year later than did the Jerseys and Holsteins.

To the end of December, 1913, certificates were issued to forty-eight Holsteins and to sixty-seven Jerseys. Up to the present time 148 Jerseys, ninety-six Holsteins, and twelve Ayrshires have received certificates.

At the end of the calendar year 1913 the leaders in the several classes of Jerseys and Holsteins stood as follows:—

TABLE A.

Name of Cow.	Name and Address of Owner.	Age at starting Test.	Fat req'd. Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		Jerseys.				
Two-year-old Class.		Y. dys.	lb.		lb.	lb.
Lady of Collingwood	F. E. Hellyer, Dunedin	1 357	240·5	365	8426·75	524·29
Three-year-old Class.						
Belvedere Rose ..	R. J. Linn, Normanby	3 19	278·9	294	8598·50	451·68
Four-year-old Class.						
Queen Marjorie II ..	A. and J. O'Donnell, Inaha	4 138	327·3	349	7649·00	430·71
Mature Class.						
Mamy I	E. Griffiths, New Plymouth	12 359	350·0	359	9722·00	514·92
		Holsteins.				
Two-year-old Class.						
Netherland Princess..	J. Donald, Westmere	1 352	240·5	343	10572·50	430·82
Three-year-old Class.						
Dutch Girl ..	G. Aitchison, Kaitangata	3 349	311·9	363	18332·25	644·54
Four-year-old Class.						
Countess of Galatea..	N. King, New Plymouth	4 290	342·5	333	12818·50	434·58
Mature Class.						
Longbeach Netherland Queen VII	J. C. N. Grigg, Longbeach	9–10 yrs.	350·0	363	16234·50	659·31

During the calendar year 1914 these leaders with one exception have been displaced. In some of the classes the competition has been so keen that pride of place was held for only a short time by any one cow. This is a healthy sign, and an indication of good work on the part of the breeders. The future will probably show a tendency to less frequent changes in this connection.

The leading positions are now held according to the following table, which has been extended to include the leaders in the various Ayrshire classes to date :—

Table B.

Name of Cow.	Name and Address of Owner.	Age at starting Test.	Fat req'd. Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	Jerseys.					
Two-year-old Class.						
Miro	A. A. Ward, Miro ..	Y. dys. 2 357	lb. 276·2	365	lb. 8835·70	lb. 548·69
Three-year-old Class.						
Pepper	A. E. Wilkinson, Pukekohe	3 195	296·5	365	9288·40	546·01
Four-year-old Class.						
Charm	F. S. McRae, Palmerston North	4 347	348·2	365	9980·10	572·52
Mature Class.						
Madam Mayflower ..	H. B. Curtis, Inglewood	5 307	350·0	365	11793·20	763·41
	Holsteins.					
Two-year-old Class.						
Netherland Princess IV	J. Donald, Westmere	2 341	274·6	365	19621·60	805·77
Three-year-old Class.						
Dutch Girl ..	G. Aitchison, Kaitangata	3 349	311·9	363	18332·25	644·54
Four-year-old Class.						
Annette V of Brundee	W. H. Bayliss, Mangatainoka	4 112	324·7	330	14401·00	545·30
Mature Class.						
Holland Queen ..	A. J. Gallichan, Tiakitahuna	5 52	350·0	365	20629·90	755·78
	Ayrshires.					
Two-year-old Class.						
Miss Russell ..	Messrs. Weir Bros., Pukehiki	2 256	266·1	340	8252·60	365·84
Three-year-old Class.						
Kanadale Fanny ..	Messrs. Cockburn Bros., Mataura	3 294	306·4	314	8918·80	361·49
Four-year-old Class.						
Posy of Cambridge ..	Messrs. J. and C. Watt, Cambridge	4 31	316·6	320	9869·10	406·91
Mature Class.						
Fancy IV of Cambridge	Ditto	8 14	350·0	365	11686·50	492·03

Although the year is not yet concluded, readers will notice the marked increase which has been made in the records of the leaders since the commencement of the year. With only one exception each class evidences a considerable increase.

In the Jersey classes there is a marked increase except among the two-year-olds. Lady of Collingwood, with a record of 524·29 lb. of fat, was not easy to displace as a two-year-old. Mr. Ward's Miro has done this, although the difference in the age is a factor which should be taken into consideration. Both Pepper and Charm, owned by Messrs. A. E. Wilkinson and F. S. McRae respectively, have done good work for their owners and their breed. Mr. H. B. Curtis's Madam Mayflower has produced the record which attracts most attention amongst Jersey fanciers. The magnificent production credited her as above places her as the highest record cow of her breed and the highest record mature cow of all breeds thus far tested by us. A yearling son of this cow was sold at auction this month for 150 guineas.

Amongst the Holsteins we have figures equally startling. In the mature class Holland Queen, owned by Mr. A. J. Gallichan, leads, the splendid record of Longbeach Netherland Queen VII having been displaced by this cow with a margin of almost 100 lb. of butter-fat. Mr. Aitchison's Dutch Girl has held the honours of the three-year-old class as no leader of any other class has done. The four-year-old class has seen two leaders during the current season. The present leader, Arnette V of Brundee, owned by Mr. W. H. Bayliss, increases last year's figures of the class by over 110 lb. of butter-fat.

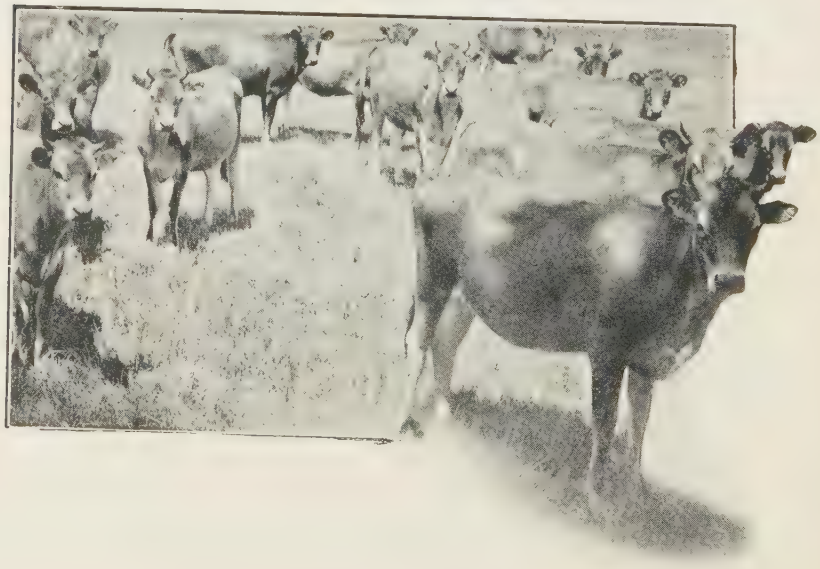
East Newton Beauty,

Of Moumahaki Experimental Farm Ayrshire herd, which gave 13,854·3 lb. of milk and 522·66 lb. of fat in 365 days, but did not qualify for registration owing to having calved eleven days later than the time specified.

While the above figures and comment indicate, in many classes, increases such as we cannot expect annually, impartial breeders will probably be unanimous in according to Mr. J. Donald's Netherland Princess IV honours as queen of our dairy breeds thus far. This heifer has dropped calves for the commencement of three lactation-periods within two years. After the first calf she produced the yield indicated in Table A, and after her second calf she produced the yield credited her in Table B. Her third calf was dropped on the twelfth day after concluding this 365-day period. During the early portion of her testing season she grazed with Mr. Donald's ordinary dairy herd.

The Future.

Our Dominion presents conditions for dairying which compare favourably with those of any other country. We have districts where nature co-operates with the breeder to a degree that renders the best success in breeding possible. There is no reason why New Zealand should not develop some of the best individuals of the distinctive dairy breeds. Nothing short of this should be our aim, and I have every confidence that our object will be attained. The future should bring some demand from overseas, for even now we have stud stock which would benefit other countries. Our local trade is being built up, and while catering to local requirements a class of dairy cattle will be developed which will doubtless attract wider attention. The successful breeding of purebred dairy stock of the right strains cannot but have a prosperous future.



POULTRY PROGRESS IN NEW ZEALAND.

F. C. Brown.

Poultry-keeping has long been regarded as the Cinderella of our primary industries. Indeed, it is only in recent years that it has received any serious attention from some leaders of rural progress as a business capable of contributing to the national wealth. To those who have studied the question even in a cursory manner it is palpable that the business is a most important factor in contributing to the income as well as reducing the cost of living of many thousands of small farmers and suburban residents. Of more recent years, with the spread of a sound knowledge of feeding and managing fowls for egg-production and the rapid increase of heavy-laying strains of several breeds, the business is proving an independent means of livelihood to an increasing number of specialists, while it is receiving much greater attention from the smaller farmer or his womenfolk, the establishment of co-operative egg circles in many parts of the country being a further encouragement to the latter. Statistics cannot assist us, but this we do know, that the consumption of eggs, in view of the high average standard of living in this country and our comparative isolation, is probably greater per head of the population than that of any other country, and that the New Zealand poultry-keeper enjoys the best markets for poultry produce in the world. It is therefore not to be wondered at that during recent years the business of egg-production has made great strides. Only a decade ago high-type laying-stock was in the hands of but a very few breeders, the bulk of the birds being the descendants of more or less fancy types. With the advent of egg-laying competitions attention was at once directed to the remarkable variation in the productive power of different strains. A revolution thereupon took place. Instead of the prize-winning bird in a fancy show-pen being sought for it was the bird possessing an egg-record performance; in other words, the bird that came to be demanded was not one that carried exaggerated feathering, comb, or wattles, but the one that possessed the best egg-yielding blood but yet was a true specimen of the breed it represented. A natural result of this awakening to the existence of special laying types was the introduction of a study of the type to be looked for. It was only to be expected with this new-found knowledge that a weakness should creep in. Confusion arose in many quarters, accentuated by the advertising of several secret methods of testing

hens for egg-yielding power. The mistake became common of considering laying-quality as everything to be desired, and while the "secret" test led breeders into a blind alley, others who rightly scouted these inventions made the mistake of disregarding breed points and constitutional vigour. Happily, at the present time, owing largely to the calibre of the men principally concerned in the distribution of special egg-laying stock, a healthier opinion is being created in regard to the type to aim at. The tendency to regard the heavy layer as an active but rather diminutive type of its breed is being checked. In this the egg-laying competitions have served a good purpose. They have publicly demonstrated that a bird to break a record must be one in which constitutional characters are just as strongly marked as those indicative of egg-yielding power, while realization of the mistake of forcing pullets to early maturity—allowing them to properly develop and build up their maximum vitality necessary in the production of a heavy artificial egg-yield—has also been a considerable factor in maintaining the desired size and vigour. With the study that has been given to the question of egg-yielding power of recent years we have come to a recognition of a definite egg-yielding type. The breeders on the two poultry plants of the Department are solely selected on this utility standard at the present time, and some of our most successful breeders of egg-laying and competition-winning stock work on the same principle.

In speaking of a special type it is not to be understood that the great laying-strains are not standard-bred stock. They are pure in every sense of the word, but without being exaggerated types of the breed they represent; in short, they combine the desired breed characters with points indicative of laying-power, not the least important of which are constitutional features. If the plates published many years ago by Lewis Wright, still the recognized highest English authority on poultry breeds, are viewed to-day they will be recognized as the types aimed at by the most successful New Zealand utility-poultry breeders, who work to Wright's standards much more closely than do breeders of the fancy strains, which are so often erroneously considered the true models of the breeds they are supposed to represent. In the year 1911 I published a picture of a White Leghorn hen (republished on the next page) which I considered at the time to be as nearly as possible the correct type of the heavy-laying bird. She still remains the type I have in my eye.

The original laying-strains of White Leghorns of this country came from the Australian States, the foundation blood being doubtless a cross between the English and American types of the breed. A happy medium was thereby struck, though the

resultant stock was practically identical with the type of White Leghorn that existed before the British fancier, assisted by the New Zealand judge, had converted the breed into a monstrosity. The best of our utility breeders aim at a definite type and do not promiscuously breed from many strains. In several notable instances unique success has been secured by judicious line-breeding from one foundation. Neither the bird of the modern English type and size nor the other extreme, the small American Leghorn, is favoured in this country, but the medium original type, bred

The New Zealand White Leghorn of a Heavy-laying Strain.

according to performance, type, and stamina. Our leading poultrymen take as a guide in working for advancement in laying-quality the lateness of moulting, preferring the bird that hangs out the longest, but giving her the necessary rest to recuperate her strength before placing her in the breeding-pen. It is the loose-feathered bird that is the first to moult, and it is the hard-feathered and thickly clothed bird, indicating strong constitution, that is the long-season layer.

The results of the New Zealand laying competition indicate clearly that the type of White Leghorn being bred by the utility-poultry keepers of this country is of a high-grade standard, a

standard it is doubtful if it would be wise to exceed if constitution and disease-resisting power is to be secured, especially freedom from ovarian weaknesses. In the eighth annual test in the 1912–13 year a pen of six White Leghorn pullets owned by W. A. Nixon established a world's record by laying 1,632 eggs in the twelve months, an average of 272 a bird. This pen was retained with five other leading pens for a two-year test, which was won by A. G. Mumby, whose six White Leghorns laid 2,711 eggs for the two years, an average of 225·83 eggs a bird, or an average of 225·91 a bird a year. This test served the excellent purpose of quite disproving the generally accepted idea that the high-type laying Leghorn is only really profitable in its first year. A two-year test for ducks took place at the same time, the winning pen of Indian Runners laying 2,767 in the two years. The owner of this pen, T. R. Hall, also holds the year's record for his Indian Runners—1,495 eggs.

With the advance in the egg-yielding power of the New Zealand White Leghorn and of several of the general-purpose breeds the housing and management of poultry are receiving the attention their importance demands. Practically all the housing being now provided is designed on the deep open-fronted system: this in order that the winter layer, the only type being aimed at by the egg-producer, may enjoy as natural conditions as possible during the main productive period without being subjected to adverse weather-conditions. They have fresh air, sunshine, and ample opportunity to exercise by reason of being encouraged to scratch for grain, which is fed in the deep litter wi h which the floor of this class of house is covered. The healthy fresh-air house favours a maximum egg-yield even in the coldest weather.

No attempt has been made to feed the high-type layer of this country on any accurately determined ration. The main features of the dietary are sound grain, principally wheat, meat by itself at about midday, with the soup provided by the cooking of this used for mixing up the morning mash, of which pollard (1 part) and bran (2 parts) are the principal ingredients. A good supply of green food is essential, for which purpose lucerne is receiving increased attention, while grit and clean water are always available. It is generally recognized that it is impossible to overfeed the high-type layer providing the right class of food is furnished.

The dietary of the egg-laying competitions is as follows: Morning, before 7 o'clock, one-third of a pint of grain (oats, wheat, split peas, or cracked maize) thrown in deep litter in the scratching-shed. 9 a.m.—mash (about 11 oz. mixed). If hungry a little more is given. All that the birds do not eat up eagerly is removed,

and less is given the next day. The mash for Mediterranean breeds consists of 2 parts of pollard, 1 part of bran (by measure), mixed with soup and meat, and for the heavy breeds 2 parts of pollard, 1 part of bran, 1 part of green food (chaffed), mixed with soup and meat. During morning, cabbage, clover (chaffed), kale, rape, or mangels are supplied. Evening—two-thirds of a pint of wheat. All grain is fed in deep litter, and a little more is given if the birds seem very hungry. Ground oyster-shell and metal grit and fresh water are always before the birds.

Though members of the farming community have not as yet taken up artificial rearing to any extent—the great majority of our farmers are too well off to pay much attention to poultry, and fail to realize the money there is in the business—specialists and suburban breeders are almost entirely dependent on the incubator and the artificial brooder. This is, of course, necessary if the winter layer is to be secured; indeed, unless some heavier breed of a non-laying strain is kept it is impossible to employ the natural methods, owing to the elimination of the brooding propensity consequent on the advancement of laying-power. The small lamp brooder is disappearing before the general adoption of a properly constructed brooder-house heated by hot-water pipes, the source of heat being either an Ideal stove, coke being the fuel, or a Perfection oil-stove burning kerosene. This means economy in production and elimination of danger from fire. A single coke-stove at a cost of 6s. a week will do the work, and do it better, than the thirty lamps which were formerly required to deal with an equal number of chicks, while the first cost is also less. Cool brooding, or rearing chicks without any artificial heat, is proving in practice fairly successful. This system should give the farmer no excuse for not adopting modern methods of egg-production. A further incentive to this end is the development of the day-old chick business, many of the most successful utility breeders and laying-competition winners now catering for the big demand for baby chicks.

Poultry-keeping in New Zealand has received a decided fillip by the establishment of co-operative egg circles, which are being supported not only by the farmer but by the specialist. Much propaganda work requires to be done yet to secure the marketing of eggs showing no deterioration from the time they were laid.

By practical tests the Department has demonstrated that properly packed eggs can be carried to any part of the world in cool storage. This has proved a source of satisfaction to our egg-producers, who have now the assurance that the markets of the world are open to them, and may be taken advantage of if at any time the values offering warrant exportation.

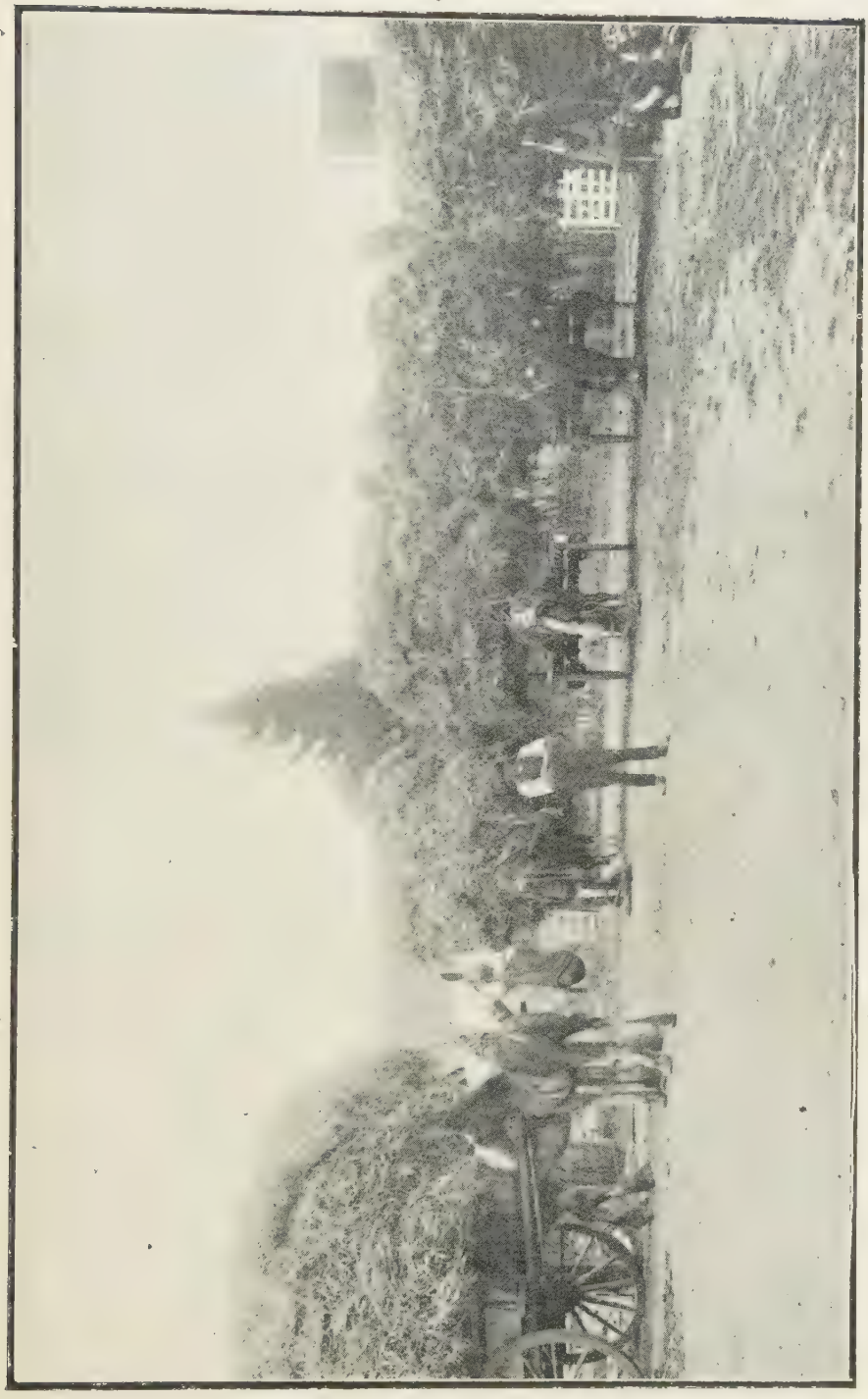
PEA AND BEAN SEED PRODUCTION.

The production of pea and bean seed has reached the dignity of an industry in New Zealand; indeed, a considerable proportion of the supply of British pea and bean seed is produced in the Provinces of Marlborough and Canterbury, where the work of seed-production finds a most congenial environment. Last year this country exported 340,000 bushels of these seeds. The area of land usually devoted to the enterprise is about 13,000 acres for peas alone, of which area 6,400 acres are in Canterbury and 5,600 acres in Marlborough, the latter producing the bulk of the garden-peas and the former the greater portion of the field-peas. Last year the pea crop averaged 31 bushels.

A feature of the trade is that the leading British seed firms are coming to depend to a large extent on New Zealand for their pea-seed supplies. In many cases the firms in question send specially selected seed out to local firms in New Zealand, where it is grown, and the produce is returned to Britain. In other cases New Zealand firms grow specially acclimatized seed for British buyers.

So far as the garden-peas are concerned, the bulk of these are grown under contract, the farmer providing the land and labour, while the seed is supplied free of cost, and a definite price per bushel guaranteed for the grower's output. In the next season the farmer is again provided with a supply of carefully selected seed, so that the purity of the varieties being grown is maintained from year to year.

The business is on a very satisfactory basis, owing to the up-to-date methods adopted by the firms engaged in it. The stock of seed produced has been procured for many years from all parts of the world, and, after acclimatization, has been improved by a rigid process of selection. This work of selection goes on uninterruptedly. Each year's seed is carefully hand-picked for degenerate specimens and undesirable forms. Some of the improved types secured have been the descendants of a plant of outstanding quality noted in the field or in the trial plots. Experience has proved that these new types have their outstanding characters definitely established, and are even less liable to variation than many of the older stocks. While the pedigree-seed crop is growing



Carting in the Pea-seed Crop in Marlborough.

strict supervision is exercised in order to eliminate rogues and undesirables, the different varieties thus maintaining purity of form. The work of inspection, if necessary, is done three or four times during the period of growth, as all rogues do not show their characteristics at the one period.

After harvesting, all seed is dressed by special machinery, which results in a fine sample being secured and finally ensures an export article from which all undesirable types and forms are eliminated.

PHORMIUM TENAX.

A NATIVE PRODUCT OF THE DOMINION.

W. H. Ferris.

Phormium tenax, the indigenous fibre-producing plant of the Dominion, provides the only instance we have in this country of the conservation of a natural resource—the production of a valuable commercial product from a native plant growing in its original state and environment without anything being done by man to improve it by cultivation or selection. Rich harvests of the fibrous leaves are being periodically obtained from the great fields of phormium, which are still in practically the same condition as when the country was first settled by British people. The only evidence of man's endeavour to maintain the fertility of the native phormium areas is the removal of foreign growth (principally the native toetoe, allied to pampas-grass) and the elimination of standing water by means of drains and canals.

Although the main avenues of supply are in swamps, this is not, as is frequently supposed, because *Phormium tenax* is a water-loving plant, but rather that it has been forced into the uncongenial habitat by reason of the advance of the evergreen forest, which is the dominant feature of the flora where phormium most abounds.

The industry of producing fibre from the native plant has passed through many vicissitudes, and though now it is in a fairly strong position, there were times when the industry would have been practically lost to the Dominion but for the fact that some of the main swamps in which it grows were either too costly or almost impossible to drain for agricultural purposes.

A Drain in a Phormium tenax Swamp.

At the present time the production of phormium-fibre represents the most intensive farming in the country, and yet, properly speaking, it is not intensive at all. Practically the only expenditure necessary to maintain the phormium crop in good condition is about £1 an acre a year (a crop is secured every three years), this expenditure being divided between clearing toetoe and rubbish and keeping the drains in order. On this expenditure it is possible to take every three years from an acre of swamp 15 tons of leaf, growing from the same roots which occupied the ground when the Native race in its cannibal days dressed the fibre by means of a shell to fashion its picturesque mats and clothing. This 15 tons of leaf produces on an average about 1½ tons of fibre, and about 3 cwt. of tow. The industry of milling phormium-fibre as we know it to-day supports more labour per acre than any other crop produced in the country. The total number of men employed at the 182 mills in operation is 3,276, and the wages of these in the twelve months would represent over £400,000. The area of land carrying the native fibre plant at the present time is about 65,130 acres, valued at £1,332,500. The capital invested in mills, plant, &c., is £314,460.

Though the European crisis has interfered somewhat seriously with the phormium-hemp trade, the business of milling is now conducted on such an improved basis, by reason of the introduction of more up-to-date and labour-saving machinery, that the cost of production has in many cases been reduced to a minimum, thereby enabling the milling of phormium-fibre to be carried on on market returns which at one time would have spelt ruination. As it is at present, prices make it impossible for some millers to continue operations. It is only those enjoying very favourable conditions, as to leaf-supply, &c., who can afford to operate their mills, and then they have to be satisfied with little or no profit.

There are 38,797 acres of land in this country planted in fruit-trees, 2,947 acres of which were planted last season. It is expected that 3,197 acres will be planted this season.

The rapid development of the main industries of New Zealand is well demonstrated by contrasting the value of the exportation twenty-five years ago and that of last year. The wool shipped abroad increased from £3,115,008 to £8,057,620, frozen meat from £628,800 to £4,449,933, and dairy-produce from £197,180 to £3,831,948, the total increase under the three headings being from £3,940,988 to £16,339,501, or over 300 per cent.

BEEKEEPING IN NEW ZEALAND.

I. Hopkins.

The earliest New Zealand colonists, as a matter of course, were not long in discovering the extraordinary abundance of nectar-bearing flora in the country, and that there were no gregarious bees which could be made use of to gather, store, and convert it into good wholesome honey for their benefit. They knew from previous observations in the Old Land the value of the hive-bee under domestication, and how great would be the gain under their new conditions if a good supply of its products could be assured. Therefore steps were soon taken to import bees. This was successfully accomplished on three occasions between the years 1839 and 1842. The climate and flora proved so eminently suitable for them that they increased at an enormous rate, and the escaping swarms and their progeny soon spread all over the country north and south.

Bee-culture at that time and down to 1878 was conducted in a very primitive fashion in New Zealand, as it was, in fact, in most countries. Straw skeps and common boxes were the form of hives in use, and commercial beekeeping as now understood was non-existent.

In 1875 the writer had the good fortune to learn what was taking place in America, and immediately after the last invention (comb-foundation) was perfected he sent for the required machinery for making it, and in the season of 1877 he introduced the Langstroth hive, honey-extractor, and comb-foundation, and had a fully equipped modern commercial apiary under way the same year—the first of its kind in Australasia.

A Drawback.

For several years the new bee-culture was taken up by all and sundry in New Zealand, who must have thought there was a fortune in it. Honey then became a drug on the market; but presently a check came—a bee-disease known as "foul-brood" (*Bacillus larva*) became prevalent, and rapidly spread throughout the land. Thousands of colonies of bees succumbed, whole apiaries were swept away, and it became a hard struggle among the most careful beekeepers to save any of their bees from

destruction. These latter might have been able to cope with and clear their bees of disease had it not been for the wilfully careless beekeepers who declined to take any trouble to keep disease down, and, foul-brood being highly infectious, it was impossible for the most careful to make any headway against it under such circumstances. Nothing but legislation to make it compulsory for all to fight the disease could do any good.

Legislation.

For over twenty years bee-culture in New Zealand was a very precarious occupation. We had the most modern appliances, practised the most modern system, and our country abounded in nectar, yet all this for the want of legislation was of no service to us. It was hardly conceivable that this state of things could go on for all time, and the needed and long-looked-for change came at last when the Department of Agriculture decided to assist in promoting the industry. The writer had the honour of being appointed to the position of Government Apiarist in January, 1905. The fact of the Department taking the industry under its care put new life into it at once. In 1906 an Apiaries Act was passed, and in 1907 it was amended. Its chief feature is in the power given to the Inspectors under the Act to destroy bees and hives affected by disease, and in the compelling of every beekeeper to keep his bees in movable-frame hives. The Act was further amended last session and new regulations made, so that it is now acknowledged to be the best Act of its kind in existence.

The Present Condition of Commercial Beekeeping in New Zealand.

Shortly after the Act was passed in 1907 two Apiary Inspectors were appointed, and since that time commercial beekeeping in this country has gone ahead by the proverbial "leaps and bounds." The following census figures for 1906 and 1911 will give a clear idea of its progress:—

Year.	Total Number of Beekeepers.	Total Number of Hives of Bees.	Output of Honey.	Output of Wax.
			lb.	lb.
1906	15,396	74,341	1,003,940	31,682
1911	11,002	71,584	1,457,272	28,061

The falling-off in the numbers of beekeepers and hives shown between the census of 1906 and 1911 is to be accounted for by the elimination of the careless individuals, who were a drawback

to the industry. If, however, a comparison is made of the output of honey per individual beekeeper between the two dates it will be seen that it is more than 100 per cent. in favour of 1911, the actual figures being a fraction over 65 lb. for 1906, and nearly 132½ lb. for 1911.

The official estimate of the number of beekeepers for 1912 is 11,200, and the value of their output of honey £50,000, which, at 4d. per pound all round, means 3,000,000 lb. The value of wax-output in these days does not count for much, as beekeepers use about as much as they harvest.

Commercial Beekeeping as a Calling.

I cannot imagine any calling better suited to small settlers than commercial beekeeping in New Zealand. They can commence on the smallest capital, and get returns from the first to assist them as they enlarge their operations. They can be practically independent of employed labour—an enormous advantage in these days—and it is a healthy outdoor occupation.

It must be remembered, however, that it requires a good deal of close application and perseverance to become a successful beekeeper. The careless, slovenly individual had better keep out of it, as he would lose by his attempt. To those fitted for it there is a comfortable living, and a small competency to reward those who persevere.

Future Prospects.

The future prospects of commercial beekeeping in New Zealand were never better than they are to-day. Everything is in our favour: we have immense areas of white clover, from which the world's best honey is gathered; we have an unlimited export demand for it; disease among our bees is fast disappearing; we have a better class of beekeepers in the business than formerly, thanks to legislation; and our trade in honey both within and without the Dominion is increasing rapidly—in fact, the demand exceeds the supply.

The export of honey last season from all parts of the Dominion could not have been far short of 130 tons, although the season was a poor one. From Canterbury Province alone it reached 70 tons. Taking our Apiaries Act and its regulations, together with the Government system of grading of all honey for export, the system of inspection of apiaries, with the facilities provided for the Inspectors rapidly moving from place to place (by motor-cycles), I have no hesitation in declaring that commercial beekeeping in New Zealand stands at the head of the world.

VITICULTURE IN NEW ZEALAND.

S. F. Anderson.

The cultivation of the grape is an industry which appeals to many settlers in easterly and northerly districts of the North Island of New Zealand, where the environment is in many respects favourable for the prosecution of viticulture on a commercial scale.

Wine made by some of the earlier settlers received very favourable comment from European experts, notably that made by the Catholic Mission Fathers at Meeanee, Hawke's Bay. At a later period wine from this vineyard obtained a silver medal at a Paris Exhibition. Encouraged by the success met with by the earlier growers, many others embarked in the industry. The introduction of phylloxera was a severe check to the industry, many vines having had to be uprooted. On the introduction of vine-stocks resistant to the *Phylloxera vastratrix* by the Government, and on the establishment of nurseries at the Waerenga and Arataki Experimental Farms for the propagation and distribution of wine and table-grape vines grafted on these resistant stocks under expert supervision, viticulture became established on a better footing. Soon after a supply of resistant stocks was assured an Instructor in viticulture was appointed by the Department of Agriculture.

Grape-culture in New Zealand has made a special appeal to many people because of its suitability to even the poorest description of land; in almost precipitous places, unsuitable for other classes of agriculture, the vine thrives.

The varieties of grape-vines for winemaking found to be most suitable for New Zealand conditions are: For red wine—Pinots Meunier and Noir, Shiraz or Hermitage, Malbec, Cabernet Sauvignon, Cabernet Franc; for white wine—Pinot Chardonay, Pinot Gris, Riesling, Verdeilho, and Pedro Ximenes. For outdoor-grown table-grapes, Black Hamburg, Golden Chasselas, Isabella, and Albany Surprise are found to give the best results. In this climate all vines require to be grown close to the ground, and the European varieties are grown on espalier trellises with the fruiting-rod on the bottom wire, which is placed not more than 1 ft. from the ground. The American varieties require much more space, because of their being very long-pruned. To further assist the ripening of the fruit the soil of the vineyard is generally kept in a perfect state of cultivation.

Harvesting the Grapes at the Waerenga Experimental Farm.

The industry has been much encouraged by the instructional work done at the Waeranga Experimental Farm, where a well-kept vineyard of 20 acres and an up-to-date winemaking plant and cellar have been established for some years. Hawke's Bay has the credit of being the first province to establish the industry on a commercial footing. The Roman Catholic Mission vineyards, first at Meeanee and now at Greenmeadows, have been making wine for over fifty years. Their wines were the first to establish the possibility of making a really high-class wine in New Zealand, and their wine still maintains a fine reputation. Following in the steps of the Mission Fathers, the late H. S. Tiffin established the Greenmeadows vineyard, which is now being conducted by Mrs. A. M. Randall. The largest vineyard is that of Mr. B. Chambers, of Te Mata, near Havelock North. Here there are 35 acres of vines and a well-equipped winemaking plant and cellars. The stock of wine in the cellars is well over 40,000 gallons.

During the year ending March last 90,350 gallons of wine was made in the Dominion. The output has steadily increased in the last few years, and were it not for the prohibition movement the area now in vines would be increased and more capital put into the best winemaking machinery.

The viticultural industry is not confined to outdoor production. The number of vinehouses is increasing every year to keep pace with the demand for a high-class table-fruit. These are distributed throughout the Dominion—from Whangarei to the Bluff. The last returns show that 715 houses, representing a capital outlay of £85,594, and producing an annual yield realizing £23,162, are in operation. The yield of outdoor-grown table-grapes last year reached the respectable figure of 600,800 lb., which at a low estimate realized £2,503.

Co-operative Fruit-testing Plots.—Twenty-seven co-operative fruit-testing plots were established by the Orchards, Gardens, and Apiaries Division of the Department last year, making a total of forty-four of these experimental areas in different fruitgrowing sections of the Dominion. Arrangements have now been made for the planting of fifteen more plots this season.

Experience has now demonstrated that New Zealand can export apples, pears, and peaches to distant oversea markets. So far the Argentine has proved our best customer. Of 51,943 cases of apples, 1,633 cases of pears, and 201 cases of peaches exported last season, the Buenos Aires market took 51,787 cases of apples and 100 cases of pears. The balance of the exports went to Vancouver and Fr'isco markets.

WORK FOR THE COMING MONTH.

NEW ZEALAND is a country of wide variation in climatic and soil conditions. In applying suggested procedure it is, therefore, necessary for the farmer to amend it to suit local weather-conditions and the requirements of his soil—information which can best be ascertained by a study of these problems on the part of the farmer himself. Nothing can take the place of local knowledge. Little advice on an agricultural subject is capable of general application in its entirety.

THE FARM.

Primrose McConnell.

The past four months will long be remembered as the most abnormal on record, as far as the weather is concerned. At Ruakura no rain of consequence has fallen for fourteen weeks, and the most careful calculations as to the providing of forage crops have been completely upset. Such seasons, however, fully demonstrate the value of lucerne or a reserve of ensilage.

Lucerne may be sown in January or February with every chance of success, provided there is sufficient moisture to germinate the seed; but if the drought still holds it is wise to delay sowing until ten days after the first good rain, so as to give the annual-weed seeds time to germinate and be destroyed by harrowing. If the seed is sown during the drought it will germinate at the same time as the weeds, with the result that the latter may take complete possession. On light, dry soils that are foul with weeds the sowing may be delayed until March, the weeds in the meantime being completely eradicated.

Harvesting will be proceeding in many districts, and as the straw, generally speaking, is very short, the binder should be set as near the ground as possible. Oats are better cut on the green side, as it ensures better-quality chaff and less waste of grain during harvest operations. The same applies to wheat. On the other hand, barley must be ripe when reaped, particularly malting-barley.

Stooking is work that demands greater attention than is generally given to it, and in bad weather careless stooking means very considerable loss. The man on the binder can make the work of stooking much easier by unceasing attention to the adjustment of the binding-table. A good stook cannot be made if the sheaves are tied too near the stubble end, as the weight of the ears and the long length of stalks between ears and band causes a portion of the ears to hang down and leaves the whole sheaf open at the top. If sheaves are placed with a good slope, the ears

pressed firmly together so as to form a sharp top on the stook, at the same time giving the sheaves a downward pressure with hand and knees, the stooks will resist much wind and rain. Stooking is an art which few men now possess. In a badly made stook the sheaves are simply dumped down close together, with the result that the top of the stook is left quite open, thus giving rain easy access. Under these conditions the grain soon commences to sprout, and a slight puff of wind will blow the whole over. Of course, any kind of stooking does for good weather (in fact, if the weather could be guaranteed there is no necessity to stook at all), at the same time it is always wise to make the stooks as if the worst weather were a certainty. The main point in stacking is to keep the centre always well filled, and before commencing to top out in particular.

Catch-crops should be sown immediately the grain crops are harvested, and of these there are many to choose from. Where there are dairy cows, Cape barley and tares (1 bushel each an acre) is one of the best mixtures. Western Wolths grass will also give excellent results, and may be cut or fed off several times. As a crop for ploughing under, crimson clover is one of the best, and little cultivation is required. In loose, clean land, if the stubble is tine-harrowed it is quite sufficient. A liberal seeding is advisable –say, 15 lb. an acre. For ploughing under, mustard is also excellent and a very quick grower. The seeding should be at the rate of 10 lb. an acre.

Spare time will be well occupied in trimming hedges, cleaning open drains, grubbing noxious weeds, &c.

In many districts lambs will now be weaned, and everything possible should be done to prevent a check in their development, particularly in the case of studs, or lambs intended for the butcher. For the latter nothing is better than rape, but in the writer's opinion stud lambs should never be put on this feed. In low, damp country, where internal parasites are prevalent, the studs should be enticed to eat a little dry feed in the shape of oats and chaff.

The use of tobacco is also undoubtedly of value as a parasite-preventive. At Ruakura a supply is always kept in the salt-boxes. Lambs will commence to nibble the tobacco when a few weeks old. The greatest difficulty was at one time experienced in raising stud lambs at Ruakura, but with the aid of dry feed and tobacco the trouble has been absolutely prevented.

For early fat or stud lambs the ewes should be mated at the end of this month, and where possible it is a good plan to remove the rams during the day and turn them among the ewes at night only. It will also be beneficial to give the rams a handful of sound oats every day right through the mating season. For fat-lamb production the crossbred ewe mated to the Southdown ram gives excellent results. The Border Leicester ram on the crossbred ewe also gives a good lamb, but it is not so early as the Southdown cross.

Young foals should be haltered before or immediately after weaning, as it saves a great deal of trouble later on, and if a foal is completely mastered in haltering it never forgets it.

THE ORCHARD.

W. A. Boucher.

The fact that few weeds will be making their appearance in orchards where the exceptionally dry conditions have been experienced will no doubt induce many growers to neglect cultivation-work. They will have failed to realize that repeated cultivation is not valuable for weed-suppression alone, but is of great assistance in maintaining that loose surface mulch which is so effective in retaining moisture, and therefore is a process of the greatest importance in exceptionally dry weather. Many small orchardists at the present time are allowing the grass to grow between their trees, with the object of converting this into hay. Using the orchard for this dual-purpose objective will, of course, mean that the hay will be produced at the expense of the fruit. Not only will the production of grass rob the trees of much of their nourishment, but with grass being grown for hay the owner will probably neglect spraying-work in order that the grass will not be trampled upon or be affected by the spraying-mixtures. Again, grass affords an excellent harbour for insect pests. In these days of critical markets it only pays to grow and sell absolutely good fruit, and unless the grower is prepared to conduct his business on the most up-to-date lines it were better for him to utilize his land for some other purpose.

Summer pruning, which is so valuable for converting useless sublaterals into useful fruit-spurs, should not be attempted before the mid-summer has gone, for to cut away a sublateral at an earlier period means that further growth will be encouraged and the object be defeated. The general rule is to cut back the sublaterals not required for main leaders to about six buds, and in the following winter to cut back again to two or three buds. A result of summer pruning, amply demonstrated by experience, is that by this diversion of the activity of the tree from limb-formation a corresponding energy of the tree is transferred to fruit-development. It must be emphasized that no main leader should be touched in the summer. The principle of summer pruning is one of the most debated topics in fruitgrowing. Yet the fact remains that some of the most successful growers have proved it to be the best method of building up a really profitable tree. It develops the fruit-spurs on those parts of the tree where the fruit should be carried—at the lower portions of the limbs. Fruit-spurs encouraged from the base of the limbs upwards means greater carrying-capacity. In other words, summer pruning means the production of fruit in the right place on the tree, therefore making for a stronger tree of heavier yielding-capacity. Of course, it will be understood that summer pruning is generally advisable only in the case of apples and pears, and then only with varieties of these which carry their fruit on spurs.

Diseases.

If spraying with kerosene emulsion for mussel scale were neglected in November and December, it is not too late to spray now in order

to kill the young scale which will be on the fruit. Some growers have used to advantage red-oil emulsion in the proportion of 1 to 60.

One of the most serious and most common pests is woolly aphis. Where the winter treatment has not been altogether effective and the aphis is reappearing the only method of effectually checking its further spread is to paint the isolated colonies with red-oil emulsion undiluted.

Codlin-moth must not be neglected. In January and February two heavy flights of the pest may be expected, therefore spraying with arsenate of lead should be continued in January. Rightly speaking, the work of spraying should have commenced just after the petals had fallen, and should be repeated at fortnightly intervals, weather permitting, till the end of February.

Arsenate of lead is useful for all chewing-insects. Therefore, while spraying for codlin-moth, leech, bronze beetle, and leaf-rolling caterpillar will also be fought.

Mixing Arsenate of Lead.

Quite a number of inquiries have been received in regard to failure to mix this spray effectively. The trouble has been that the work of mixing has been gone about in the wrong way. The arsenate should be placed in the bottom of the vessel, the water being added gradually in small quantities. It is useless to attempt to make the arsenate dissolve well by adding the whole of the water at the one time.

A mistake made in preparing Bordeaux mixture is to be in too great a hurry in adding the water to the lime. The lime should be slaked as gradually as possible.

GRAPE-CULTURE.

S. F. Anderson.

Black Hamburg, Foster's Seedling, and Duke of Buccleugh ripen their fruit this month in the cool vinehouse. General watering of the vines and syringing should be stopped when the fruit begins to colour. All danger of mildew (that is, the *Oidium*) affecting the fruit of these earlier-ripening grapes is now past. Where it can possibly be avoided, do not take off any more foliage after cutting the fruit until the natural fall of the leaf. The growth made during this period is considerable, and should be allowed the greatest freedom. It restores or makes up for the loss to the plant from summer pruning, ripens the wood, and assists the storing-up in those buds at the base of the laterals that vitality which enables the vine to send out strong fruit-bearing wood the following spring. To enable them to do this give plenty of air night and day. This applies to all vines. In the case of the later-ripening varieties, such as Gros Colman, Barbarossa,

Alicante, Lady Downes, Golden Queen, Mrs. Pearson, and other late sorts, the treatment is different. After midsummer the sun-heat is not so great, and the temperature of the house must be maintained as far as possible, consistent with good ventilation, to fully ripen them. Where it can be done without reducing the foliage to any great extent or exposing the grapes to the direct rays of the sun, more light may be admitted to hasten the ripening by pushing aside the foliage.

Cyaniding for mealy bug can be done any time after the grapes have attained their full size, by exposing them to the fumes for one hour—see Bulletin No. 40 for directions for doing this. Mildew may still affect the late grapes. The best way to apply sulphur at this time of the year is by distillation, as described in last month's *Journal*. This also controls any red spider which may be present.

In growing grapes for commercial purposes early and late varieties should not be cultivated together. The reason for this will be obvious from the directions given above.

The season so far promises freedom from some fungoid diseases. Being dry, however, there is greater danger from red spider and thrip. If any of the leaves show a rusty appearance, red spider may be looked for. Thrip causes a somewhat similar appearance, with more of a dirty look. Thrip also marks the surface of the berries.

THE POULTRY-YARD.

F. C. Brown.

With the cost of production, or rather the price of foodstuffs, practically doubled from what it was at this time last year the poultryman cannot afford to be feeding a bird which is not showing a profit or is not likely to do so in the immediate future. All cockerels of this year's breeding which have reached a marketable age should be off the plant by January, and no time should be lost in topping off the younger ones. It is poor economy, even when feed is cheap, to keep cockerels after they are four months and a half old. If the cockerel is not marketed at this age it will be weeks and may be months before it can be brought to prime condition; and then, although heavier than at a prime-chicken stage, the return is hardly likely to be a profitable one. Immediately the chicken stage has departed the consumption of food is increased, caused largely by the greater growth of plumage, bone, &c., necessary in the development of the adult bird, and this process must be completed before the prime adult stage can be attained. Even if a fully developed cockerel is marketed in an absolutely prime condition it does not appeal to the poulterer, to whom it is known as a "stag." It is coarse and larger than is generally desired for the high-class trade. The flesh of the prime four- to five-months-old bird is distinctly superior to that of one double the age. It is the Christmas lamb of the poultry trade.

In addition to clearing out every available cockerel the poultryman will be wise who culls every hen over two years of age and any year-old and two-year birds which do not promise a continuance of heavy production. Do not, above all, under present conditions, try to rear a weakling chicken. It is a fatal mistake to endeavour to economize in the feed bill by giving the birds a smaller allowance. Better to feed half a flock thoroughly well than put a whole flock on half-rations. Feed may be high in price, but nothing will be saved by stinting the layer. Many reports are reaching me of birds going into a moult. This is due either to underfeeding or the supplying of a food which the birds do not relish. The only safe way to save on the feed bill is to provide an abundance of green feed, which the majority of poultrymen can produce themselves.

Losses in Young Stock.

It is very unsatisfactory to know, in spite of repeated warnings given in these notes against overcrowding, that complaints are pouring in upon me of heavy mortality among chickens after these have left the brooder. The symptoms described all point to the old trouble resulting from sweating induced by overcrowding. The incubator will have been carefully managed, the chickens well looked after in a good brooder, and then the care slackens, and the young ones are turned out into cramped and unsatisfactory quarters, maybe the improvised shelter of a case—good enough for a quarter of the number being handled, but a death-trap for a big lot of chickens. It is no doubt thought that putting many chickens into a small space will enable them to secure the desirable warmth and comfort, but the fact is overlooked that huddling a crowd of chickens in a small space where they cannot secure sufficient supply of fresh air brings on a sweated and unhealthy condition, which often develops into the trouble now causing so many of my correspondents serious anxiety. The usual symptoms are a weakened condition of the limbs, with the joints swelled, the swelling making its first appearance at the hock-joints and then travelling to the wings, a fluid oozing from the swollen parts. A gangrenous condition subsequently sets in. In the final stage of the trouble the swelling extends to the neck and head, and mortality rapidly ensues. The question of cure can only be considered in the very early stages. Isolation and provision of roomy sanitary quarters, in which the chickens will have the needed comfort (combined with fresh air) without their being compelled to secure it by huddling, are the first requirements. Good feeding and protection from extremes of weather—both cold and heat—are also necessary. In dealing with this, as well as other poultry troubles, the poultryman should use his own judgment. Imagine the chickens are little human beings and handle them accordingly, or go back to the old hen and study her method of rearing chickens. She gives them warmth, but they can all breathe the outside atmosphere. I have seen people provide a stuffy box for a hen and chickens, but nothing would induce the hen to go into it if she could get any protection at all from bad weather-conditions outside of it.

Scaly Leg.

A correspondent tried vaseline and sulphur for this trouble, but complains that this took the scales off the legs of the affected birds.

Now, vaseline and sulphur should be an excellent dressing for scaly leg, and it is only natural that the scales will come off, especially in bad cases. Of course, new scales will form when the trouble is removed and the leg regains a normal condition. The best way to fight scaly leg is to prevent it, and the best preventive is thorough cleanliness in the houses and runs.

Incubation.

A Dunedin correspondent, who does not furnish his name, suggests a note on a hatching trouble he has experienced. This will be done when space is available, probably next month.

THINGS TO REMEMBER.

The words "Fresh air" should be placed over the door of every poultry-building.

Even if food-prices are high, the hen of the right laying type will return a good profit.

It is only the well-fed growing pullet that will produce the maximum yield in the dear-egg season.

A safe principle at all times is to weed out any bird showing signs of a weak constitution.

Close confined, or lice-infested, quarters is generally responsible for the bad habit of feather-pulling.

THE APIARY.

F. A. Jacobsen.

Seasonable Hints.

Now is the time that bees should be gathering honey freely. Full advantage should be given them to gather the maximum of nature's bounty. It is essential that ample room for storage purposes be available for each colony. When putting on a fresh super, place it immediately above the brood-chamber with the other supers above it; the bees will then commence to work on it at once.

Queen-introducing.

I have had very good reports lately of introducing queens by smoke. One large apiarist has not had a miss this season. The method is to kill the queen in the hive you wish to requeen, then, when the bees have settled down again, puff a little smoke into the hive at the entrance; run the new queen in, and follow her up with smoke. The method has been especially successful in the Wairarapa.

Instructions for introducing by the "eating out" method are always sent by the queen-breeder with each queen mailed. The latter is the better plan for the amateur.

Thick Honey.

In districts where thick unextractable honey is gathered prior to the main honey-flow it is advisable to take this away and replace with empty combs, in which the bees will store the better quality. Extract bare in the autumn and replace the thick honey for winter stores.

Section Honey.

In cases where the bees are required to produce section honey the supers should contain one or two partly completed sections as "baits" to induce the bees to commence drawing comb. Without these the bees usually take a long time to start work on them, and sometimes refuse altogether.

Apiary at the Ruakura Farm of Instruction.

THE GARDEN.

W. H. Taylor.

Vegetable-culture.

During the last week in November cabbage-seed should have been sown for the winter supply. If seed was not sown, it should be at once put in. A week lost now has an important bearing on the quality of the crop. To obtain the best results the plants should be set out in their permanent quarters during the first week in January; if put out much later the produce will be small. Broccoli-seed is sometimes sown at this time, but it only meets a measure of

success, for the heads are sure to be small, and it would be wiser to purchase plants. Early in January is time enough to plant broccoli, but it may be better to do so at once. The soil is likely to be in a better condition for promoting growth now than in a month's time, and a good start may make all the difference between success and failure, especially if the season should prove dry. Late planting never pays, for unless a certain amount of growth is secured before the days materially shorten it is not to be obtained at all. When the soil is very dry it is necessary to help the plants to re-establish themselves, the worst way to do so is to water after the plants are set out; surface watering is not lasting in effect. In ordinary soil a large amount of water is not required. The plan I have always found to answer well is as follows: When planting a considerable number get an old iron bath-tub and put about 3 in. of water in it. Draw the plants and stand them with their roots in the water. Fill the tub with plants if sufficient are available. It is as well to let the first plants drawn stand in the water at least an hour before planting: they get well charged with water, and are in no immediate need of more when planted out. A certain amount of soil is carried on the roots of the plants. This lies on the bottom of the tub, for it mostly falls off into the water. When lifting a bunch of plants, take a handful of the mud and rub it over the bunch of roots. This protects them from the sun and air and keeps the roots moist. In ordinary circumstances I have never found it necessary to water after planting. If the soil is abnormally dry, make the hole for the roots of a plant and, having inserted the plant, fill the hole up with water, and then return the soil. This is the method known as "puddling." By its adoption some of the moisture will be retained for over a week. This plan is too tedious for large operations.

Celery plants should now be large enough to put out in trenches. It is quite useless to expect this vegetable to grow in very dry ground. It is almost impossible to give either too much water or too much manure. Planting in trenches is better than surface planting, because in the former case it is easier to give water, and, furthermore, because the soil is cooler at the bottom of a trench than on the surface. It is more economical to grow two rows in a trench than one. This is the most common method, however. A single row enables the largest heads to be grown. For a single row the trench may be as narrow as a spade will dig it, while for two rows a little more than the width of a spade is necessary. Dig out a good spit, and shovel out the loose crumbs, and the depth will be sufficient. If the manure is well rotted it may be dug in at the bottom of the trench. To do this it may be necessary to throw out another spit. The manure is then put in, and the soil last thrown out is returned, care being taken that the manure has been firmly trodden down before being covered. It is a good plan to well water the trench a day or two before planting. After planting give a thorough watering. If the weather be bright some shade will be valuable till the plants are started. Tree-fern fronds are excellent for the purpose.

Peas should be sown twice during the month; *French beans* once. *Runner beans* should be provided with a support of some kind. There

are many devices for this purpose. Sticks of manuka scrub are as handy as anything. Wire netting strongly fixed is neat and efficient, two widths giving the needful height. It is worth taking some trouble to enable these beans to climb, for if they are allowed to lie on the ground they give a very small crop. Sow *lettuce* in drills, and thin the plants. Sow *turnip* in small quantity as required. To maintain a supply it will be necessary to sow at intervals of about eight weeks. The last crops of *carrots*, *parsnips*, and *red beet* should now be ready for thinning. There should be no delay in this, as it materially influences growth. Keep the surface soil loose. The effect of this on growth is magical. *Onions* for pickling may yet be secured by sowing seed of Silverskin at once. The soil chosen should be rather poor, but of a nature that will not bind together. Tread it down firm, and draw rather broad drills. Scatter the seed evenly and much closer than in ordinary sowing. The aim should be to have the seedlings so close together as to prevent any from growing large, this being effected by semi-starvation, together with the growing of the right kind. Silverskin assumes the proper-shape bulb as soon as it begins to grow, so that however small they may be their shape is right; moreover, the texture of the white-skinned varieties is such that it allows vinegar to thoroughly penetrate, thus making a better pickle than the undersized bulbs of the brown varieties, which are often used. Cutting *asparagus* should have ceased before now. If newly planted *rhubarb* has been pulled from, no more should be used this season, or it will not have opportunity to build up good crowns for next season, and on this depends the quality of the spring crop—the only crop that is worth considering.

Tomatoes.—It is important that the waste growth should be suppressed as soon as possible. All the side shoots are waste growth. All leaves on the bearing-wood should be left. It is quite wrong to think that foliage which shades the fruit delays ripening. It is the heat of the atmosphere that ripens the fruit, not direct sunshine, and the most perfectly ripened fruit invariably comes from underneath the foliage. The foliage is the lungs of the plant. It is, however, wise in cases of abnormally large leaves to cut away the lower half of each. Tomato-plants growing in the open should rarely be watered; in fact, never, except in abnormally dry conditions.

Small Fruit.

Raspberries.—Keep all superfluous suckers cut away, for undue crowding prevents proper ripening of new fruiting-canes, and waste growth of any kind robs the soil of moisture, and in various other ways acts detrimentally.

Currants, Red and White.—These bear all their fruit on spurs, and growth is therefore useless except as a means of providing spurs. All the shoots except leaders should be cut back to about 6 in. in length. The effect of this will be to promote the formation of fruit-buds at their base. In winter they will be cut back still further, but this must not be done now, for if cut too low the bottom buds will break into growth instead of forming fruit-buds. On the other hand, if no shortening

is done the strength of the shoots prevents the formation of the buds at the base.

Gooseberries.—As soon as the fruit is gathered it will be wise to give a spraying with with 4-4-40 formula of the Bordeaux mixture. As a preventive of leaf-spot this is very effective.

Strawberries.—It is not good to allow indiscriminate formation of runners. There is a great difference in varieties in respect to fruitfulness, but it is seldom that what one may term ultimate and penultimate runners bear fruit the first season. To get good plants no runner should be allowed to make more than two plants, and if only one so much the better. After that it should be nipped off as soon as it shows growth. And, further, the plants should not be allowed to make a crowd of runners that are not wanted. Growing runners not wanted is useless robbery of the soil.

Flower-culture.

Arrangements for the summer should be now all complete. In the ordinary garden little is required except to keep it trim and clean. Be careful not to remove dead foliage of bulbs before marking the spot with a distinctly written label. Never trust to memory in this matter. A moment's forgetfulness may lose you a valued clump of bulbs. Now is a good time to sow seed of perennial trees, shrubs, and plants. Just at this time any one having frames or a glasshouse will not be engaged with a lot of annuals, &c., and this offers a good opportunity for raising other classes of plants. Wattles of various kinds require raising in small pots. Various climbing-plants such as the kennedyas and hardenbergias are handiest so raised. These and many things may be raised now and got out of hand to some extent before ordinary routine work demands the space.

Carnations and Pinks.—Pinks are mostly known by the pure-white variety, but there are a number of other forms. The prettiest are those with crimson or maroon centres. These are really very desirable. They make a first-class edging for bed or border, quite as good as regards foliage as some things that have no other merit, and then there are the flowers. Pinks are very easily propagated. Tear off shoots so as to take with them a heel of older wood. Plant them quite close together in boxes filled with light soil and surfaced with sand; water at once through the rose of a watering-pot. Stand the box in a cool, semi-shady place, look after them in the watering, never allowing them to become dry. Every cutting should strike. Cuttings may be taken now or at any time for the next two months. They may be raised from seed; also carnations, for which the present is a good time.

Under the Fruit-preserving Industry Amendment Act, passed this year, advances up to £9,000 can be obtained from the Government for the purpose of establishing cool stores for fruit, the chief object being to encourage growers to serve local markets in a systematic manner throughout the year.

S. B. Taylor, *photo.*]

GROSSE CALIBASSE PEAR-TREE AT RUAKURA FARM OF INSTRUCTION.

Seven years old from graft. Weight of crop last season, 185 lb.

COMMERCIAL INTELLIGENCE.

EXPORT OF PEACHES FROM NEW ZEALAND TO SAN FRANCISCO.

E. Clifton.

The experimental shipment failed to secure admittance, the presence in the larval form of an unidentified insect precluding the consignment from reaching the San Francisco market. The only report that can be supplied is that the fruit was of admirable quality and in fair condition. It arrived at a time when it would have been welcomed by retailers and would have been attractive to consumers. The tidings of this consignment claimed the attention of fruit-farmers and of salesmen. The inquiry is now made, "Is New Zealand likely to send any large quantity of peaches to this country?" It exercises their minds to a very considerable extent, for, remember, a great extent of California is a fruit-farm. It is almost under the same conditions as if California sent butter to New Zealand. Still, the fruit can only come at a time when it fills the place on a comparatively bare market, for in the season when peaches can arrive from New Zealand fresh fruit is comparatively scarce here. No doubt New Zealand will send a certain quantity of fresh fruit in certain seasons, and, in anticipation of the time when these fruits may arrive, it is essential that they reach the American consumer in the most perfect condition. It is therefore important that, apart from the freedom from insect or fungoid pests, the condition of the fruit must be most carefully attended to; to attract attention, to obtain reasonable prices, the condition must be unexceptional at the time of market. It may be as well to advise New Zealand of the experience of Canada in the shipment of peaches from Ontario to Great Britain. An abridgment of the report by Messrs. Ruddick and Moore, of the Department of Agriculture, Ottawa, may provide some useful information:—

"So long ago as 1898 the Department of Agriculture of Canada made a shipment to Great Britain of seven thousand cases of soft fruit; of these, fourteen hundred were peaches. Sample lots had been sent in earlier years and with gratifying results, although it had been generally believed that it was not practicable to land Canadian peaches in Great Britain at a profit. There had been a disinclination on the part of private persons to undertake further testing of that market, therefore the Department of Agriculture undertook the experiment.

"The fruit was carried in refrigerator cars from the peach districts of Ontario and Montreal. At the port of arrival a temperature of 60° F. was recorded on one of the cars when it was being unloaded. In three other consignments the temperature ranged from 44° to 50°. All the peaches were reported to have been received in good firm condition on arrival at this port, Montreal. They were then transferred without delay from rail to ship, and arrived in Great Britain in good condition. It was found that peaches held at slightly above 32° maintained condition longer than those that had been carried at the higher temperature. South African peaches are carried to London at a temperature of 34° to 36° F. The voyage is seventeen days from Cape Town to London. The keeping-quality of the peach is not great, and it is believed that these seventeen days about came to the limit of endurance and maintenance of high quality. The average time of the transportation of fourteen shipments of Canadian fruit to London was twelve days eight hours. This fruit has almost uniformly been received in good condition, especially with the lower temperature. This temperature is maintained on the ship, but between Ontario and Montreal the temperature has undoubtedly been somewhat too high. The peaches are forwarded in cases the inside dimensions of which are 18 in. by 11 in. by 3½ in. These cases weigh 3 lb. when empty, but

when packed they contain about 9 lb. of fruit. The timber is ¼ in., except the end pieces; cleats ¼ in. wide are nailed on the top and the bottom to secure ventilation when the cases are piled in cars or in the holds of the ships. A layer of wood-wool was used at top and bottom of the case, each peach wrapped in tissue-paper and then encircled in a band of wood-wool. Some cases were not packed with this wool. These carried equally well and realized as much money, but dealers appreciate the wool packing as the most attractive to their customers. For convenience of handling and to prevent pilfering, three cases were crated together. The greatest care to prevent bruising was insisted upon. This care commenced in the orchard, where they were carried in shallow baskets into the packing-shed. The fruit was not permitted to be any greater depth than that of two layers of fruit. The cases cost about 3d. to 4d. each, the wood-wool 2½d. per pound, ½ lb. being required to each case."

The period of maturity at which peaches should be packed for export is of primary importance. Great judgment is needed to determine the time of picking to assure that the fruit will possess colour, flavour, and firmness when it reaches the consumer in from two weeks and a half to three weeks. The more mature the fruit at picking the greater is the need of care. It is considered essential that peaches should reach the consumer as quickly as possible after being picked. It is claimed that the Canadian shipments have shown that peaches from Canada can be landed in good condition in London provided that due precautions are observed in preparing them for shipment. Only peaches of good quality and good size and colour should be shipped. Every detail requires scrupulous attention.

Mention has been made here of preparing for shipment: this, apart from care to prevent bruising and the stage of ripeness of the peach, is of the greatest importance—that is, the precooling before shipment. Fruit precooled may be packed in a more mature condition than those boxed and railed without this precaution having been taken. The great advantage in this is that the peach may be packed and transported in the more matured condition without injuring its flavour or colour. The railage, of necessity, must be in an insulated refrigerator car. In the ocean steamer the temperature may be between 35° and 40° if the freight has been delivered on board in good condition. It is also an advantage if the temperature during the last thirty-six hours of transit may be raised to 55° in the ship's refrigerator. This will avoid the condensation of moisture on the fruit from the warmer outside air. It is pointed out that in Great Britain there is a comparatively limited market unless prices are accepted at a much lower rate than is usually accepted for out-of-season peaches—that is, out-of-season peaches in Great Britain are sought for in limited quantities at a very high rate, and to some extent New Zealand must realize that this condition applies in San Francisco. Such fruit appeals as a luxury only, and under such conditions there cannot be a wide demand. The general recommendation is that the exportation of peaches to American markets should be strictly limited to fruit of the highest quality, and that all details must receive the most rigid attention; and, so far as this market in America is concerned, the experience of last year must be avoided and the fruit be absolutely free of pests, either insect or fungoid. As you are aware, this fruit was taken on to Vancouver; there, however, it received the same condemnation and was destroyed.

AGRICULTURAL SHOW DATES.

Woodville A. and P. Association.—Woodville, 27th January, 1915.

Thames Valley A. and P. and H. Association.—Te Aroha, 28th and 29th January, 1915.

Helensville A. and P. Association.—Helensville, 29th January, 1915.

Dannevirke District A. and P. Association.—Dannevirke, 10th and 11th February; Ram Fair, 12th February, 1915.

ANSWERS TO CORRESPONDENTS.

CORRESPONDENTS are requested, when desiring information through the Journal in regard to disease in animals and plants, to forward, where possible, affected specimens, in order to facilitate a correct diagnosis of the trouble and to ensure the best advice. In stating a question the most complete descriptive details should be furnished.

Correspondents desiring information in regard to manurial treatment of soil are requested to fill in and forward the prescribed form—"Application for Advice as to Manurial Treatment of Soil"—obtainable from any office of the Department in the Dominion.

In every instance a question to which an answer is desired in these columns must be accompanied by the full name of the inquirer, not necessarily for publication, but as a guarantee of good faith.

TROUBLE WITH LAWN-GRASS.—SPRAYS.

C. W. BABBAGE, St. John's Hill, Wanganui :—

1. I have a tennis-lawn on sandy soil, and each year a number of rings of fungus or toadstool grow on it. The grass on the ring withers, and the soil on the spots becomes very dry and hard. Can you recommend any cure ?

2. Is the Sherwin-Williams lime-sulphur mixture as efficacious as the Bordeaux mixture for fruit-trees and the black spot on potatoes and tomatoes ? Should the spraying be continued up to the time of the setting of the fruit ?

The Orchards, Gardens, and Apiaries Division :—

1. The lawn is apparently attacked by the fungus which causes the condition known as "fairy ring." The affected portions of the turf should be carefully lifted and the ground below watered several times with Bordeaux mixture, afterwards replacing the turf. The Bordeaux will kill the vegetative system of the fungus.

2. Freshly made Bordeaux mixture has given the best all-round results for the control of fungus diseases on fruit-trees, tomatoes, &c.

IMPROVING LAWN.

H. D. STRONACH, Maori Hill :—

Please recommend the best treatment for a lawn which has become greatly overrun with dandelions and daisies, and is also subject to grass-grub. The object desired is to gradually improve the condition of the lawn without adopting the drastic method of digging it up.

The Fields and Experimental Farms Division :—

Hand "spudding" is about the most practicable and effective way of dealing with dandelions and daisies on a lawn. After that is done apply lawn-sand on the patches. Fison's lawn-sand has proved effective. In the autumn a top-dressing with soil should be made. If the grass is not growing well an application of superphosphate and blood-and-bone manure at the rate of from 3 cwt. to 6 cwt. per acre is advised. There are no satisfactory methods of dealing with the grass-grub. Carbon bisulphide has been used at times with good results. An account of this treatment was given in the October, 1913, issue of the *Journal*.

Storing Potatoes.—Wheat-growing.

"Cockatoo," Kohukohu, Hokianga :—

1. Would you be good enough to tell me the correct way to store potatoes. Last season's crop I stored in a pit about 2 ft. deep. After filling up to ground-level I put an inch or so of loose dry earth on top, similar to the way the Maoris pit kumeras. The pit is in a warm, dry situation with a good roof over it. So far as soundness is concerned they have kept well, but they are sprouting very much, and have been for a good time. I may say that when I lifted the crop a good many were inclined to grow (sprouting). The varieties are Up-to-Date and Gamekeeper.

2. I should like to plant a patch of wheat next autumn. Would it do to feed it off during winter and early spring months? If so, could I expect a reasonable crop of grain (fowl-feed)?

The Fields and Experimental Farms Division :—

1. The best method of storing potatoes is in a cool, dry shed with plenty of space for air and ventilation. If you have a pine-plantation the shed could be built under the trees in this. It should be roofed, with open sides covered with wire netting. If you decide to have shelves they could be made of narrow battens or partly battens and part netting. To prevent sprouting as much as possible, potatoes require to be kept cool and hard.

2. It would not affect the crop of grain if you do not have the wheat fed down too severely in the early spring.

Grass-mixture.

J. W. Harding, Inglewood :—

I am putting down about 30 acres of ploughed medium land in grass. Would you kindly inform me if it would be best sown down with 3 lb. rape and 1 bushel of tares with 3 cwt. rape-manure. If not, kindly inform me what would be best.

The Fields and Experimental Farms Division :—

It would not be advisable to sow down with the quantities of rape and tares mentioned. The tares would probably smother out the grass. One pound of rape alone, sown with the grass, would be sufficient. Not knowing the constituents of the rape-manure, it is impossible to advise.

Grass for Identification.

"Matty Surface," Manawatu :—

I am forwarding a sample of grass that I got growing on a dry piece of swamp which seemed too dry for other grasses to take. Would you kindly let me know the name of the sample, as I would like to give it a trial. When is the best time for sowing same?

The Biologist :—

The grass is sweet vernal (*Anthoxanthum odoratum*). This grass is generally looked upon as a weed, and its use under any conditions is not advocated.

Blight in Potatoes.

E. W. N., Mokotua, Southland :—

Would you kindly give me some information on the subject of spraying for the prevention of blight on potatoes—the ingredients required, the method of mixing, method of application, when to apply, and quantities required for 1 acre; also the

best instrument for spraying (for a small plot), and the probable cost of same; also cost of spray—in fact, any information that would be of service to one having no knowledge on the subject.

The Orchards, Gardens, and Apiaries Division :—

Full particulars regarding the spraying of potatoes for the control of blight are given in a leaflet issued by the Department, of which a copy has been posted you. The quantity of spraying-fluid used for an acre of potatoes is from 60 to 80 gallons, at a cost of about 5s. to 5s. 9d. per acre. A very suitable sprayer for a quarter-acre and upwards is the Eclair knapsack spray-pump, costing about £2 10s. This is fitted with suitable nozzles for covering both upper and under sides of the leaves.

Blight on Peach-tree.

J. J. M., Bull's :—

Under separate cover I have posted a small twig of a peach-tree which is blighted. What is the blight, and what shall I do to control it?

The Orchards, Gardens, and Apiaries Division :—

The peach-tree specimen has been attacked by the black aphis. Spray with McDougall's insecticide, procurable from seedsmen and others.

Fertilizers for Turnips.

"Waimarama," Kapuka :—

1. Is basic superphosphate still in the experimental stage, or has it been exhaustively tried and proved superior to superphosphate? Would you recommend an extensive use of it for turnips and swedes instead of superphosphate?

2. Does the quicklime need to be mixed immediately before sowing, and must the 15-per-cent. proportion be adhered to?

3. Is there any fertilizer which should not be mixed with it?

As this is a great turnip district, any information along these lines would be very much appreciated.

The Fields and Experimental Farms Division :—

1. It depends largely on the soil whether it is preferable to use basic slag, superphosphate, or basic super. Convincing field experiments have yet to be made before one can dogmatize as to the relative efficiency of different phosphates on New Zealand soils. This also covers the second question.

2. More lime may be added than 15 per cent. without harm, but 15 per cent. is sufficient to revert all the superphosphate in a short time. The mixture may be stored.

3. Basic superphosphate, if much lime has been used, should not be mixed with fertilizers containing ammonia salts, and if mixed with potash salts the mixture should be applied as soon as possible

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Eradication of Sorrel.

T. F. Valentine, Papakura :—

Can you advise a method of ridding a paddock of sorrel? I have a paddock of about 10 acres quite red with sorrel. Neighbours say, "Put lime on it—the soil is too sour." Last year the paddock was sown in oats and the crop cut, but this year the sorrel has almost taken possession. The soil is a hard clay, good in patches.

The Fields and Experimental Farms Division :—

Cultivation, especially during summer, combined with cutting, liming, and judicious manuring to encourage useful plants, will ultimately lead to the extermination of sorrel. Lime is claimed to assist in destroying this weed. Probably the action of lime is that it renders the soil more alkaline, and provides a condition in which other plants flourish. At the same time the withdrawal of acid reduces the vigour of the plant, as it is accepted as thriving where the soil is acid. Draining the land will materially assist in sweetening the soil.

Buckwheat for Ensilage.

R. Wallath, Westown, New Plymouth :—

Can buckwheat be made into ensilage, and, if so, what is its feeding-value ?

The Fields and Experimental Farms Division :—

Having had no actual experience in the making of buckwheat into ensilage, the Division is not in a position to recommend its use for this purpose. Owing to the insufficiency in bulk of buckwheat and to its inclination to seed readily it would be advisable to mix it with other material, such as grasses, clovers, oats, and tares, when making the stack—every alternate layer 3 ft. in depth. Its suitability for silage can then be judged. In regard to its feeding-value, there are other fodders, such as several varieties of maize, which would be preferable, taking into consideration the quality and the weight given per acre. If the area is unlimited, buckwheat may be worth a trial if cut in the early stages of maturity.

Club-root in Swedes.

A. Sneyd, West Plains, via Invercargill :—

Have you a bulletin you could forward me on the control of club-root in swedes ? If so, I shall esteem it a great favour ; or could you give me full particulars of the best method of checking this blight ?

The Fields and Experimental Farms Division :—

We have no bulletin on the control of club-root. There is no absolute remedy for club-root, but basic slag acts as a good preventive. Do not use superphosphate. Growing mangels instead of turnips is perhaps the best plan, but in any case always grow them previous to a turnip crop. The mangel contracts few diseases, is a good fodder, grows a heavy yield per acre, does not taint milk if fed to cows, and if sown early can be fed fairly early in the season. Do not grow turnips after rape, or *vice versa*. After growing a crop of rape or turnips do not grow either crop again except at intervals of some years, and even then have a mangel crop in between. Lime acts as a preventive to some extent, but it is slow in action. Apply ground limestone at rate of 1 ton per acre immediately land is ploughed, and thoroughly harrow in.

Barley and Vetches.

W. J. Watson, Brixton, Taranaki :—

I should be pleased if you could inform me if barley and vetches sown together at the same time mature at the same time. I sowed some in the beginning of August, and the barley has been out in ear about three weeks ago, but there is no sign of any flowers belonging to the vetches.

The Fields and Experimental Farms Division :—

Barley, in a normal season, would mature somewhat before vetches. In a dry season, such as the present one, it would probably mature a good deal earlier. In a wet, cold season, vetches, in common with other plants, would mature about the same time as barley.

STATISTICAL.

THE LIVE-STOCK OF NEW ZEALAND.

The following table gives the total number of horses, cattle, swine, and Angora goats in the Dominion for the years 1908 (October) and 1911 (April), and of sheep for the years 1912 and 1913 (30th April):—

Horses.	
1911	404,284
1908	363,259
Increase	41,025
Cattle.	
1911	2,020,171
1908	1,773,326
Decrease	246,845
Sheep.	
1913	24,191,810
1912	23,750,153
Increase	441,657
Swine.	
1911	348,754
1908	245,092
Increase	103,662
Angora Goats.	
1911	6,119
1908	2,494

Summary of Horses, Cattle, Sheep, and Pigs for the Years 1904 to 1913.

Year.	Horses (does not include Asses and Mules).	Cattle.	Sheep.	Pigs.
1904	314,322	1,736,850	18,280,806	255,320
1905	326,537	1,810,936	19,130,875	249,727
1906	342,608	1,851,750	20,108,471	242,273
1907	352,832	1,816,299	20,983,772	241,128
1908	363,259	1,773,326	22,449,053	245,092
1909*	..	..	23,480,707	..
1910*	..	..	24,269,620	..
1911	404,284	2,020,171	23,996,126	348,754
1912*	..	..	23,750,153	..
1913*	..	..	24,191,810	..

* No figures available except for sheep.

EXPORTS and IMPORTS of LIVE-STOCK from and to the Dominion during the Years ended 31st March, 1903 to 1905, and 30th September, 1906 to 1913.

Year.	Exports.				Imports.			
	Horses.	Cattle.	Sheep.	Dogs.	Horses.	Cattle.	Sheep.	Dogs.
1903*	282	3,071	48,447	20	244	30	1,237	68
1904	345	396	21,813	17	733	30	302	132
1905	316	471	7,893	30	333	36	357	140
1905†	162	197	5,541	15	82	18	71	82
1906	522	516	12,640	32	147	17	308	129
1907	531	340	15,409	22	77	27	592	127
1908	616	195	5,865	19	109	19	409	103
1909	1,064	281	6,535	23	83	17	182	123
1910	4,616	214	12,356	58	114	47	197	143
1911	6,462	371	7,030	109	124	128	548	138
1912	2,350	420	5,624	141	129	151	867	136
1913	879	267	12,509	93	177	166	446	175

* Does not include number sent to South Africa. † Six months, April-September.

	Exports.								Imports.							
	Horses.		Cattle.		Sheep.		Dogs.		Horses.		Cattle.		Sheep.		Dogs.	
	1912.	1913.	1912.	1913.	1912.	1913.	1912.	1913.	1912.	1913.	1912.	1913.	1912.	1913.	1912.	1913.
Auckland	574	227	406	252	2,310	3,979	47	43	16	18	84	82	60	18	18	39
Wellington ..	864	246	12	11	85	1,637	67	26	32	28	58	62	97	69	55	61
Napier	22	1	..	..	2	78	..	1	2	5	..	..	..	..	1	..
Lyttelton	483	124	..	2	2,348	2,270	15	4	30	94	9	22	610	244	39	62
Dunedin	141	159	..	2	341	289	4	13	22	22	..	..	100	115	16	7
Bluff	258	116	..	..	279	2,971	8	6	27	8	..	..	..	..	6	5
Other ports ..	8	6	2	..	259	1,285	..	..	..	2	..	..	..	..	1	1
Totals ..	2,350	879	420	267	5,624	12,509	141	93	129	177	151	166	867	446	136	175

TOTAL AREA IN CULTIVATION AND IN OCCUPATION IN EACH PROVINCIAL DISTRICT AS AT 1st JANUARY, 1911, WHEN THE LAST GENERAL CENSUS WAS TAKEN.

ACREAGE.

Provincial District.	Crops.		Fallow Land.	Sown Grasses.		Orchards, Vineyards, Gardens, and Plantations.	Area under Cultivation.	Native Grass, Tussock, and Unimproved Land.	Total Area in Occupation.
	Corn and Pulse.	Green.		Land ploughed.	Land not ploughed.				
Auckland	52,811	57,502	56,201	802,262	2,541,999	35,871	3,546,646	4,222,402	7,769,048
Taranaki	11,984	23,982	3,274	211,189	793,385	2,895	1,046,709	311,562	1,358,271
Hawke's Bay ..	22,819	35,573	7,281	356,925	1,405,543	7,329	1,835,470	1,375,616	3,211,086
Wellington ..	49,327	58,799	7,183	357,980	2,699,664	11,854	3,184,807	1,249,948	4,434,755
Marlborough ..	36,344	11,614	3,189	100,255	421,898	2,791	576,091	1,864,018	2,440,109
Nelson	32,071	18,475	5,445	139,318	418,063	10,100	623,472	1,690,644	2,314,116
Westland	668	1,524	778	9,903	73,768	307	86,948	874,120	961,068
Canterbury ..	474,503	228,936	64,708	1,455,519	507,446	25,770	2,756,882	3,830,705	6,587,587
Otago—									
Otago portion ..	193,994	136,995	40,220	818,416	227,346	11,617	1,428,588	6,569,364	7,997,952
Southland portion	141,301	140,282	21,694	748,459	125,403	3,138	1,180,277	1,983,857	3,164,134
Totals ..	1,015,822	713,682	209,973	5,000,226	9,214,515	111,672	16,265,890	23,972,236	40,238,126

AREA OF THE DOMINION.

The total area of the Dominion, including Chatham and other islands, is 104,362 square miles, or 66,791,680 acres. Of this area the North Island has 28,584,145 acres, 16,773,160 acres being in occupation, while the South Island has an area of 37,083,858 acres with 23,432,867 acres in occupation.

COMPARATIVE TABLE SHOWING VALUE AND QUANTITY OF EXPORTS OF NEW ZEALAND PRODUCTS.

YEARS ENDING 31ST MARCH, 1913 AND 1914.

	Value.				Quantity.			
	1913.	1914.	Increase.	Decrease.	1913.	1914.	Increase.	Decrease.
	£	£	£	£				
Wool	8,065,945	7,584,063	..	481,882	195,782,543 lb.	182,373,696 lb.	..	13,408,847 lb.
Lamb	1,825,342	2,548,964	723,622	..	901,146 cwt.	1,186,638 cwt.	285,492 cwt.	..
Mutton	1,544,250	1,905,583	361,333	..	1,092,692 ,,	1,271,935 ,,	179,243 ,,	..
Beef	324,578	446,704	122,126	..	260,880 ,,	325,593 ,,	64,713 ,,	..
Salted beef ..	13,248	13,570	322	..	8,408 ,,	8,452 ,,	44 ,,	..
Live-stock	88,243	74,766	..	13,477	10,548 numb.	12,920 numb.	2,372 numb	..
Preserved meats ..	118,711	120,011	1,300	..	41,010 cwt.	36,469 cwt.	..	4,541 cwt.
Rabbits and hares ..	50,851	77,967	27,116	..	63,480 ,,	94,107 ,,	30,627 cwt.	..
Bacon and hams ..	11,135	5,174	..	5,961	298,928 lb.	114,956 lb.	..	183,972 lb.
Hides	234,735	288,631	53,896	..	155,230 numb.	193,080 numb.	37,850 numb	..
Sheep and rabbit skins	860,782	916,420	55,638	..	16,826,066 ,,	15,083,096 ,,	..	1,742,970 numb.
Tallow	672,849	701,085	28,236	..	23,011 tons	24,234 tons	1,223 tons	..
Sausage-skins (casings)	93,638	109,459	15,821	..	3,912,720 lb.	3,751,773 lb.	..	160,947 lb.
Butter	2,056,615	2,138,310	81,695	..	369,133 cwt.	394,861 cwt.	25,728 cwt.	..
Cheese	1,859,179	2,195,273	336,094	..	634,173 ,,	742,371 ,,	108,198 ,,	..
Hemp	483,353	679,628	196,274	..	21,567 tons	27,052 tons	5,485 tons	..
Tow	41,005	60,828	19,823	..	4,106 ,,	6,160 ,,	2,054 ,,	..
Timber	475,320	316,658	..	158,662	91,770,115 sup. ft.	64,851,807 sup. ft	..	26,918,308 sup. ft.
Kauri-gum ..	430,200	575,285	145,085	..	8,353 tons	9,271 tons	918 tons	..
Fungus	9,611	5,532	..	4,079	4,221 cwt.	2,149 cwt.	..	2,072 cwt.
Gold	1,305,217	1,461,955	156,738	..	332,359 oz.	378,798 oz.	46,439 oz.	..
Silver	86,922	94,813	7,891	..	816,119 ,,	883,435 ,,	67,316 ,,	..
Coal	238,703	177,273	..	61,430	253,912 tons	176,712 tons	..	77,200 tons.
Minerals	20,779	33,784	13,005	..	1,743 ,,	3,888 ,,	2,145 tons	..
Wheat	95,414	11,806	..	83,608	302,143 centals	37,365 centals	..	264,778 cental
Oats	468,880	18,858	..	450,022	1,956,548 ,,	62,009 ,,	..	1,894,539 ,,
Barley	42,638	671	..	41,967	98,550 ,,	1,768 ,,	..	96,782 ,,
Beans, peas, and maize	120,234	80,036	..	40,108	497,556 bush.	..	..	..
Bran and pollard ..	19,695	6,126	..	13,569	4,312 tons	..	..	..

COMPARATIVE TABLE SHOWING VALUE AND QUANTITY OF EXPORTS OF NEW ZEALAND PRODUCTS.

YEARS ENDING 31ST MARCH, 1913 AND 1914—*continued.*

—	Value.				Quantity.			
	1913.	1914.	Increase.	Decrease.	1913.	1914.	Increase.	Decrease.
	£	£	£	£				
Seeds, grass and clover	71,148	67,573	..	3,575	38,038 cwt.	41,351 cwt.	3,313 cwt.	..
Flour	2,882	1,283	..	1,599	313 tons	154 tons	..	159 tons.
Hops	20,698	26,430	..	5,732	2,340 cwt.	5,150 cwt.	2,810 cwt.	..
Potatoes	150,601	7,014	..	143,587	19,944 tons	1,602 tons	..	18,342 tons.
Chaff, hay, and straw	3,918	1,357	..	2,561	856 „	221 „	..	635 „
Fish and oysters ..	83,433	38,506	..	44,927	..	..	..	..
Other N.Z. products ..	400,342	465,755	65,413	..	..	..	..	..
Total N.Z. produce	22,391,094	23,203,126	812,032	..	..	..	..	..
Re-exports ..	248,940	239,262	..	9,678	..	..	..	..
Specie	403,555	32,661	..	370,894	..	..	..	..
Totals	23,043,589	23,475,049	431,460	..	..	..	..	..

	£
Exports, 1914, as per table	23,475,049
Exports, 1913, as per table	23,043,589
Total increase in value of exports, 1914 ..	£431,460

MEAT-EXPORT WORKS.

NAMES of COMPANIES preparing FROZEN MEAT and MEAT PRODUCTS for export from the Dominion; the Killing-capacity, Storage-capacity, and By-products of Works.

District.	Name of Company.	Killing-capacity: Sheep per Day.	Storage-capacity: Sheep.	Products of Works.
Auckland ..	Whangarei Freezing Company, Limited	600	12,000	Frozen meat, tallow, manure, oil, skins, and hides.
„ ..	Auckland Farmers' Freezing Company, Limited (Auckland) ..	2,000	40,000	Frozen meat, wool, tallow, pelts, manure, oil, &c.
„ ..	R. and W. Hellaby, Limited (Auckland)	1,200	5,000	Frozen meat, tallow, manure, wool, pelts, casings.
„ ..	Tokomaru Sheep-farmers' Freezing Company, Limited (Tokomaru Bay)	1,500	60,000	Frozen meat, wool, tallow, pelts, manure, casings.
Taranaki ..	Thomas Borthwick and Sons (Australasia), Limited (Waitara Freezing-works)	3,000	50,000	Frozen meat, preserved meat, tallow, manure, &c.
[illegible] „ ..	Patea Farmers' Co-operative Freezing Company, Limited (Canville Works)	625	15,000	Frozen meat, preserved meat, tallow, manure, &c.
Hawke's Bay	Gisborne Sheep-farmers' Frozen Meat Company, Limited ..	4,500	110,000	Frozen meat, preserved meat, tallow, manure, pelts, &c.
„	Nelson Bros., Limited (Gisborne)	2,500	65,000	Frozen meat, extract of meat, tinned meats, tallow, manure, wool, pelts, oil, runners, hoofs and horns, &c.
„	„ „ (Tomoana)	3,500	95,000	Ditto.
„	North British and Hawke's Bay Company, Limited (Napier) ..	1,500	30,000	Frozen meat, tallow, &c.
„	Thomas Borthwick and Sons (Australasia), Limited (Hastings) ..	2,500	50,000	Frozen meat, tallow, &c.
„	Hawke's Bay Farmers' Meat Company, Limited (Whakatu) ..	2,000	32,000	
Wellington	Wanganui Meat-freezing Company, Limited (Wanganui Works, Castlecliff)	3,000	60,000	Frozen meat, tallow, manure, wool, pelts, oil, hides, hair, runners, &c.
„	National Mortgage and Agency Company, Limited (Longburn) ..	750	25,000	Frozen meat, extract of meat, tallow, manure, wool, pelts, oil, hides, ice, horns, hair, runners, &c.
„	Gear Meat Preserving and Freezing Company, Wellington (Works, Petone)	7,000	170,000	Frozen meat, canned meat, extract of meat, tallow, manure, wool, pelts, oil, hides, runners, &c.
„	Wellington Farmers' Meat Company, Limited (Waingawa) ..	2,000	43,000	
„	Wellington Meat-export Company, Limited, Wellington (Works, Ngahauranga)	6,000	150,000	Frozen meat, preserved meat, tallow, manure, wool, pelts, runners, premier jus, &c.
„	W. Dimock and Co., Limited (Wellington)	1,000*	30,000	
Marlborough	Christchurch Meat Company, Limited (Picton)	1,000	30,000	Frozen meat, tallow, manure, oil, oleo, glue, gelatine, bacon, &c.
Nelson ..	Nelson Freezing Company, Limited (Stoke)	350	10,000	Frozen meat, tallow, manure, &c.
Canterbury	Canterbury Frozen Meat Company, Limited (Belfast)	5,500	118,000	Frozen meat, preserved meat, tallow, manure, wool, pelts, oil, premier jus, runners, &c.
„	„ „ (Fairfield) ..	4,000	80,000	Ditto.
„	„ „ (Pareora) ..	4,500	100,000	„
„	Christchurch Meat Company, Limited (Islington)	6,000	120,000	Frozen and preserved meat, tallow, oleo, oil, pelts, glue, gelatine, bacon, &c.
„	„ „ (Smithfield)	5,000	100,000	Frozen meat, preserved meat, tallow, oleo, oil, glue, gelatine, bacon, &c.
Otago ..	„ „ (Burnside)	1,500	60,000	Frozen meat, preserved meat, rabbits, hares, tallow, manure, wool, oil, &c.
„ ..	„ „ (Pukeuri)	3,000	60,000	Frozen meat, preserved meat, rabbits, hares, tallow, manure, wool, oil, &c.
„ ..	South Otago Freezing Company, Limited (Balclutha)	1,000	25,000	Frozen meat, wool, tallow, pelts, manure, oil, and preserved meats.
„ ..	Birt and Company, Limited (Ocean Beach)	2,500	100,000	Frozen meat, rabbits, hares, manure, wool, runners, &c.
„ ..	Southland Frozen Meat and Produce Export Co., Ltd. (Mataura)	2,500	110,000	
„ ..	„ „ (Makarewa)	3,000	10,000	Frozen meat, rabbits, fish, tallow, oil, manure, wool, pelts, &c.
„ ..	„ „ (Bluff)†	..	110,000	
„ ..	W. E. Tait (Woodlands)	650	..	Preserved meats, meat-extract, tallow, runners, preserved rabbits, wool, pelts, manure.

* Pigs. † Refrigeration store only.

THE DOMINION'S EXPORTS TO BRITAIN.

COMPILED FROM MANIFESTS OF VESSELS SAILED DURING RESPECTIVE MONTHS OF CURRENT AND PRECEDING SEASONS.

Month.		Mutton, Carcases.	Lamb, Carcases.	Beef, Quarters.	Pork, Carcases.	Butter, Boxes.	Cheese, Crates.	Wool, Bales.	Wheat, Sacks.	Oats, Sacks.	Rabbits, Crates.	Hemp, Bales.	Tow, Bales.	Kauri-gum, Cases.
January,	1914	231,766	464,185	30,424	33	150,492	136,086	108,742	..	500	2,851	15,234	4,306	11,133
,,	*1913*	*166,714*	*229,179*	*6,886*	*611*	*109,251*	*63,864*	*118,986*	..	*329*	..	*6,969*	*2,215*	*4,110*
February,	1914	354,190	334,207	14,100	3	86,570	59,532	127,372	..	4	..	3,709	633	7,607
,,	*1913*	*326,337*	*403,698*	*12,666*	*64*	*89,098*	*81,733*	*127,968*	..	..	..	*12,520*	*4,295*	*7,973*
March,	1914	446,522	551,313	36,689	..	61,060	62,732	95,175	..	..	..	8,187	2,562	3,958
,,	*1913*	*86,224*	*210,166*	*7,428*	*250*	*47,560*	*59,844*	*49,661*	..	*115*	..	*12,552*	*7,662*	*4,043*
April,	1914	234,765	366,786	22,185	..	7,822	63,796	58,488	..	2,901	..	1,247	888	5,909
,,	*1913*	*303,937*	*647,948*	*16,834*	*457*	*11,358*	*52,934*	*61,988*	..	*300*	..	*9,049*	*3,351*	*3,889*
May,	1914	336,632	638,397	39,315	54	837	37,776	43,364	3,623	11,062	..	8,355	2,112	9,316
,,	*1913*	*418,221*	*731,520*	*22,073*	*100*	*637*	*46,304*	*33,281*	..	*265*	*2,000*	*15,751*	*5,005*	*9,057*
June,	1914	261,877	634,981	36,400	..	1,153	19,247	18,774	..	28,141	1,000	7,924	4,258	7,881
,,	*1913*	*315,034*	*528,815*	*24,444*	*588*	*79*	*3,166*	*18,741*	..	..	*13,072*	*13,592*	*4,065*	*5,439*
July,	1914	225,411	239,143	38,170	..	1,355	2,003	15,868	..	1,425	1,000	5,810	2,584	8,053
,,	*1913*	*215,713*	*331,353*	*14,030*	..	..	*1,687*	*17,169*	*5,651*	*300*	*9,190*	*9,682*	*1,720*	*10,793*
August,	1914	84,251	63,111	19,094	516	1,979	50	4,845	600	38,220	10,403	367	245	3,705
,,	*1913*	*161,593*	*178,263*	*13,129*	*6*	*8*	*407*	*8,494*	*11,604*	*45*	*38,480*	*3,714*	*2,310*	*6,406*
September,	1914	53,386	49,200	2,353	..	15,885	..	3,337	..	5,896	7,288	1,143	57	..
,,	*1913*	*133,122*	*83,521*	*5,334*	*16*	*6,575*	*2,020*	*7,176*	..	..	*16,336*	*3,826*	*1,501*	*10,049*
October,	1914	291,432	128,016	49 104	..	81,842	30,487	8,938	..	68,660	38,121	2,042	1,650	1,683
,,	*1913*	*14,122*	*25,735*	*580*	..	*42,847*	*21,452*	*2,705*	..	..	*10,020*	*6,986*	*3,672*	*2,923*
November,	1913	20	1,479	..	..	53,468	23,722	1,891	..	..	2,478	4,162	771	2,314
,,	*1912*	*54,175*	*8,286*	*282*	..	*140,751*	*57,181*	*33,305*	*3,680*	*40,896*	*13,892*	*9,866*	*1,911*	*5,466*
December,	1913	128,087	86,890	8,909	..	249,526	124,821	51,385	..	250	24,479	19,807	5,276	11,273
,,	*1912*	*117,740*	*106,310*	*4,774*	..	*119,885*	*66,213*	*44,789*	*5,868*	*30,490*	*10,070*	*3,816*	*2,613*	*3,686*

NEW ZEALAND-SAN FRANCISCO TRADE.

FOLLOWING are the shipments of produce for San Francisco, Tahiti, and Rarotonga, and transhipments for Vancouver from New Zealand, since July last:—

—	"Maitai," 21st August.	"Moana," 16th Sept.	"Marama," 15th Oct.	"Maitai," 12th Nov.
Gum, packages	..	6	30	12
Seeds, sacks	..	..	..	..
Grain, &c., sacks	580	172	107	32
Meat, cases	152	48	8	37
Onions, cases	16	3	7	2
Potatoes, sacks	28	3	29	3
Sundries, packages	260	1,512	328	629
Butter, boxes	7	..	5	4
Hemp, bales	..	98	114	456
Frozen lamb, carcases	2	4	2	5
Hides and sheep-skins, sacks and bales	527	517	463	250

NEW ZEALAND-VANCOUVER TRADE.

FOLLOWING are the shipments of produce for Vancouver and North American ports from New Zealand since July last:—

—	"Niagara," 3rd July.	"Marama," 31st July.	"Makura," 8th Sept.	"Niagara," 1st Oct.	"Makura," 29th Oct.
Butter, boxes	7,163	8,325	6,036	5,950	4,850
Mutton, carcases	..	7	..	..	..
Lamb, ,,	58	..	..	..	..
Beef, quarters—pieces	1,308	900	..	..	..
Veal, carcases	..	..	..	..	..
Frozen sundries, packages	82	84	30	36	..
Wool, bales	19	25	..	127	109
Grass-seeds, beans, &c., sacks	66	63	..	26	..
Hides and skins, sacks, &c.	530	193	..	1,103	1,054
Onions, cases	..	..	..	..	..
Sheep-skins, bales	122	32	6	152	..
Jam, cases	75	35	65	590	..
Sundries, packages	19	10	4	603	45
Pelts, casks	..	4	1	..	34
Kauri-gum, packages	150	17	6	1,277	840
Hemp, bales	243	..	246	744	246
Rabbits, crates	15	..	..	..	..
Timber, pieces	..	..	..	..	..
Eggs, cases and crates	..	6	149	247	974
Meats (canned, &c.), cases	77	16	35	36	..
Cheese, crates	37	..	..	..	..
Fresh fruit, cases	..	..	..	..	..